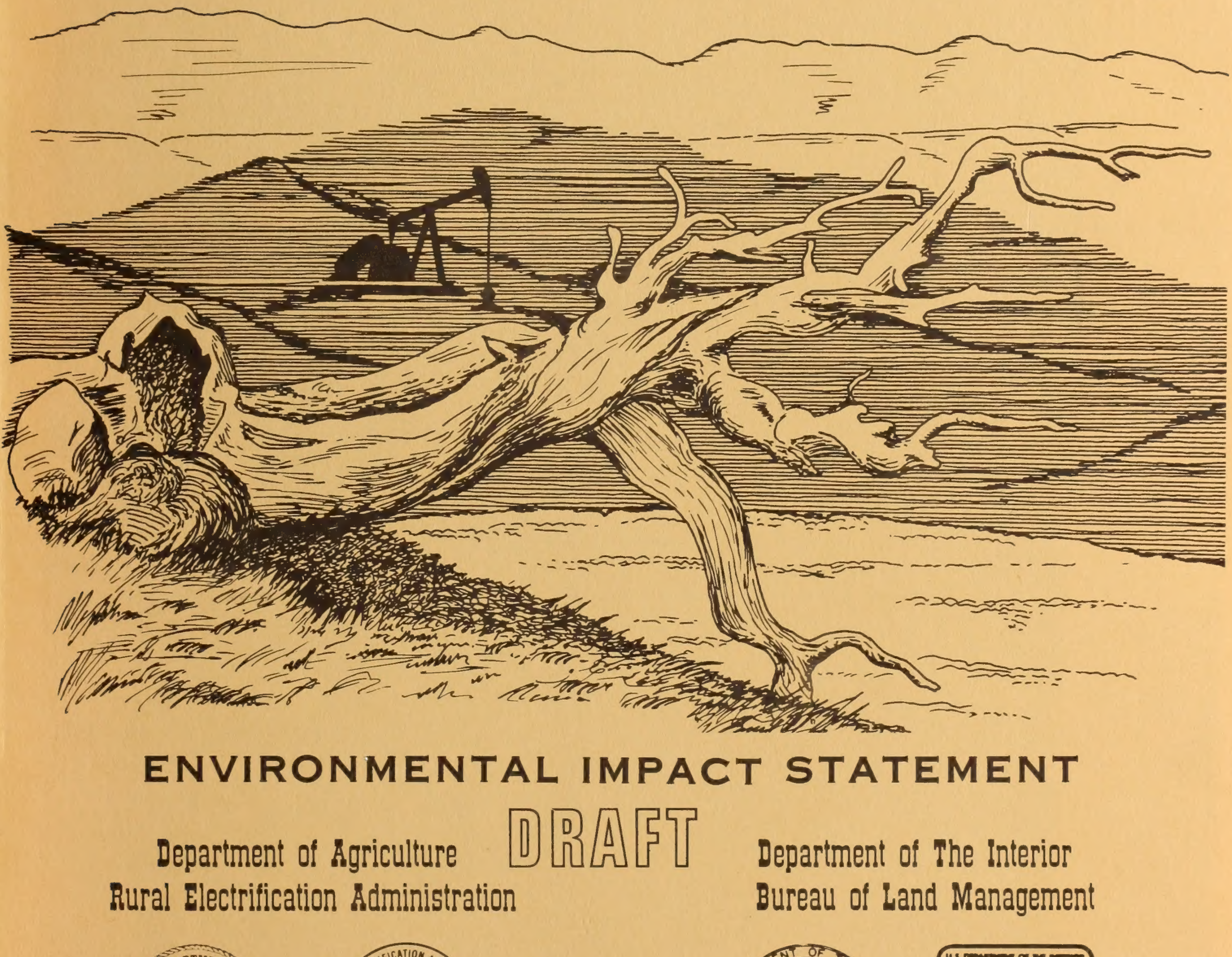
MOON LAKE POWER PLANT PROJECT
Units 1 and 2



ENVIRONMENTAL IMPACT STATEMENT

DRAFT

Department of Agriculture
Rural Electrification Administration

Department of The Interior
Bureau of Land Management

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
136 East South Temple
Salt Lake City, Utah 84111

IN REPLY REFER TO
1792 ML
(U-910)

January 8, 1981

Dear Reader:

Enclosed for your review and comment is the Moon Lake Power Plant Project Units 1 and 2 Draft Environmental Impact Statement (EIS) prepared by the Bureau of Land Management, Richfield District Office and by the Rural Electrification Administration.

Public hearings on the Draft EIS have been scheduled in the following communities:

February 17, 1981 Salt Palace, Room 220 Salt Lake City, Utah 7:00 p.m.	February 18, 1981 Uintah County Courthouse Vernal, Utah 7:00 p.m.	February 19, 1981 High School Auditorium Rangely, Colorado 7:00 p.m.

Comments on the Draft EIS may be submitted in writing or presented verbally at the public hearings. Comments should be addressed to:

Greg Thayn, Team Leader
Bureau of Land Management
University Club Building
136 East South Temple
Salt Lake City, UT 84111

Telephone No: 801 524-5645
FTS: 588-5645

Written comments received by March 3, 1981 and testimony presented at the public hearings that pertain to the adequacy of impact assessment or present new data will be fully considered and evaluated in the Final EIS. Comments received after March 3, 1981 will be considered in the decision-making process, but will not be responded to in the Final EIS.

Please retain your copy of this Draft EIS. In accordance with Council on Environmental Quality (CEQ) regulations, portions of this document may not be reprinted.

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

MOON LAKE POWER PLANT PROJECT
UNITS 1 AND 2

(USDA-REA (ADM) 81-1-0)

Jointly Prepared By

BUREAU OF LAND MANAGEMENT
DEPARTMENT OF THE INTERIOR

and

RURAL ELECTRIFICATION ADMINISTRATION
DEPARTMENT OF AGRICULTURE

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COVER SHEET

Moon Lake Power Plant Project Units 1 and 2
Environmental Impact Statement

(X) Draft ( ) Final

Joint Lead Agencies

U.S. Department of the Interior, Bureau of Land Management
U.S. Department of Agriculture, Rural Electrification Administration

Agencies Which Provided Information

Environmental Protection Agency
U.S. Department of Agriculture
- Forest Service
- Soil Conservation Service

U.S. Department of the Interior
- Fish and Wildlife Service
- Geological Survey
- Heritage Conservation and Recreation Service
- National Park Service
- Office of Surface Mining

Western Area Power Administration
U.S. Department of Transportation
- Federal Aviation Administration

Other Responsible Agencies With Jurisdiction

Federal Communication Commission
Interstate Commerce Commission
President's Advisory Council on Historic Preservation
U.S. Department of Defense
- Army Corps of Engineers

U.S. Department of Energy
U.S. Department of the Interior
- Bureau of Indian Affairs

U.S. Department of Transportation
- Federal Highway Administration

States, Counties, and Reservations that Could Be Directly Affected

State of Colorado
- Moffat County
- Rio Blanco County

State of Utah
- Carbon County
- Daggett County
- Davis County
- Duchesne County
- Juab County
- Morgan County
- Salt Lake County
- Summit County
- Uintah County
- Utah County
- Wasatch County
- Weber County

State of Wyoming
- Uinta County

Uinta and Ouray Indian Reservation

Abstract

This statement assesses the environmental consequences of alternatives designed to meet, at least in part, the baseload energy needs of the Deseret Generation and Transmission Cooperative of Murray, Utah. The statement focuses on alternative power plant sites, coal supply and transport systems, water supplies, energy generation technologies, and energy conservation as well as the No Action alternative.

The major environmental topics discussed are related to air quality, water resources, threatened and endangered fish species, land use, and socioeconomics. A discussion is also provided on the purpose and need for the proposed project.

For further information regarding this statement contact:

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USDA - REA
South Agriculture Bldg., Room 5831
Washington, D.C. 20250
Telephone: (202) 477-6183
FTS 477-6183

Date by Which Comments on the Statement Must Be Received:

Forty-five (45) days after the statement is made available to the Environmental Protection Agency and the public (45 days after date below).

Date Statement Made Available to the Environmental Protection Agency and the Public:

Draft: January 8, 1981.

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SUMMARY

INTRODUCTION

The Deseret Generation and Transmission Cooperative (Deseret), headquartered in Murray, Utah and comprised of six rural electric distribution cooperatives, has applied to the Bureau of Land Management (BLM) for rights-of-way to utilize public lands in development of their Moon Lake power plant project (Moon Lake project), units 1 and 2. Deseret has also applied to the Rural Electrification Administration (REA) for loan guarantees to finance the project.

Deseret's proposal is to initiate construction of one 400-megawatt (MW) unit in 1981 and to bring it on line in late 1984. Depending on future power demands, a second 400-MW generating unit could be built as early as 18 months following initiation of unit 1 construction or as late as the 1990s.

Deseret furnishes power to residential, commercial, agricultural, and public institutional consumers in five states (Utah, Colorado, Wyoming, Nevada, and Arizona) with the majority of these consumers located in Utah.

PURPOSE AND NEED

Deseret does not have sufficient generating capacity to fulfill all its customers' needs. The bulk of its load and service requirements is purchased from other suppliers - the Department of Energy's Western Area Power Administration (WAPA) and Utah Power and Light Company (UP&L) through Deseret's membership in the Intermountain Consumers Power Association (ICPA). Power purchases from WAPA are limited, and a Utah Public Service Commission Order has directed UP&L to terminate its wholesale power sales agreements with members of ICPA by March 1985. Therefore, Deseret cannot rely on UP&L for an adequate and reliable power supply beyond 1985, and the purchased power costs would be significantly increased at that time if open market sources were available and had to be used.

A Power Requirement Study (PRS) completed by Deseret in 1978 contains load projections reflecting an analysis of historical growth trends and anticipated future use characteristics, energy conservation, load management, population growth, economic development, etc. The power projections seem reasonable, considering Utah's growth rate during the past decade and that projected for the 1980s. During the decade of the 1970s, Utah's population grew by 29 percent. The Utah State Planning Coordinator's Office has indicated that the State's population is projected to increase from 1.42 million in 1980 to 2.27 million by the year 2000. In terms of total change, this represents a 60-percent increase (Utah State Planning Coordinator, 1980). The PRS indicates that Deseret cannot meet its future energy demand without additional generating capability.

APPLICANT-PROPOSED ACTIONS

Deseret's proposed location for the power plant is the Bonanza site located northwest of Bonanza, Utah in Uintah County.

Deseret's proposed course of action would be to pipe water approximately 19 miles from a collector-well system located beside the Green River (about 2.5 miles upstream from Walker Hollow) to the Bonanza site. This water would

be taken from a 30-cubic-feet-per-second (cfs) (21,720 acre-feet per year) water right owned by Deseret.

Up to 2.7 million tons of coal for the generating station (assuming two units) would be supplied annually from a proposed underground coal mine (Deserado Mine) located approximately 7 miles northeast of Rangely, Colorado. This mine would be operated by Western Fuels Utah, Inc., of Lakewood, Colorado. Coal would be delivered to the Bonanza plant by a 35-mile-long electric railroad.

The electricity generated by unit 1 of the proposed plant would be distributed to Deseret's consumers by four transmission lines; one 345-kilovolt (kV) alternating current (a.c.) line and three 138-kV a.c. lines. The 345-kV line would extend from the generating station to a UP&L substation proposed for construction near Mona, Utah in Juab County. The 138-kV lines would extend from the generating station to existing substations near Upalco, Utah in Duchesne County; Vernal, Utah in Uintah County; and Rangely, Colorado in Rio Blanco County. The 138-kV line to the Upalco substation would be placed on the same towers as the 345-kV line to Mona. If unit 2 were constructed, a second 345-kV line would be built from the plant site to the existing UP&L Ben Lomond substation near Ogden, Utah or to the oil shale fields in Utah and Colorado. The actual destination would depend upon power demands.

THE SCOPING PROCESS

In accordance with the National Environmental Policy Act of 1969 as amended (NEPA) and the implementing regulations of the Council on Environmental Quality (Federal Register, Vol. 43, No. 230), the proposed project was presented to the public for comment.

Three scoping meetings were held by the BLM-REA and Deseret to identify the significant issues related to the project. These meetings were held at Ft. Duchesne, Utah, on May 29-31, 1979; Rangely, Colorado, on September 10, 1979; and Vernal, Utah, on September 11, 1979. The meetings held in Rangely and Vernal were public meetings. The meeting held at Fort Duchesne was for local, State and Federal agencies.

In addition to the formal scoping meetings, numerous contacts have been made with various Federal, State, and local agencies, special interest groups, and individuals (see Chapter 5). Additional public meetings on transmission line routing issues and alternatives were held by BLM and the U.S. Forest Service in Salt Lake City, Utah on January 16, 1980 and Price, Utah, on January 17, 1980.

The major issues identified in the scoping meetings as being of primary concern in analyzing the applicant's proposal were comparative financial costs of alternatives; social and economic impacts on communities in Utah and Colorado; degradation of air quality in the Uinta Basin and at Dinosaur National Monument (Dinosaur); impacts on endangered fish species in the Green and White Rivers; and effects on salinity in the Colorado River system.

ALTERNATIVES DISCUSSED

PLANT SITE ALTERNATIVES

Two plant sites, Bonanza and Rangely, have been analyzed.

The selection of the preferred and alternative sites is the final stage of the site evaluation process as conducted by Deseret under the direction of

REA. Initially, an inter-disciplinary team was convened and the site selection methodology was established and approved. All of the apppropriate Federal, State, and local agencies were contacted by the team and their input was utilized to identify all potential constraints to siting within the established study area. Eventually 12 potential sites were selected for more intensive study. Through a process of elimination, this number was reduced to five candidate sites and eventually, through further screening, the two most viable sites were determined. Next, the formal scoping process (described previously) was conducted jointly by BLM and REA. The relevant issues raised during the scoping process as they relate to the Bonanza and Rangely plant sites are evaluated in this document.

The Bonanza site in Utah was selected as the applicant-proposed plant site because of recommendations by the Utah State Siting Committee and its proximity to the Green River which could be used as a water source. The Rangely site in Colorado was selected as an alternative site because of its proximity to the coal source at the Deserado Mine.

COAL SUPPLY ALTERNATIVES

Two sources of coal for the power plant have been analyzed for either the Bonanza or Rangely sites. These are development of the Deserado Mine or open market purchase (both include other Federal coal leases). The Deserado Mine is the applicant-proposed source.

COAL TRANSPORT ALTERNATIVES

Five modes of coal transport have been evaluated. These are: (1) electric railroad; (2) overland conveyor; (3) slurry-pipeline; (4) on-highway truck haulage; and (5) off-highway truck haulage. All of these modes are analyzed for the Bonanza plant site. Only the overland conveyor and off-highway truck haul are analyzed with the Rangely plant site. Deseret's proposed alternative for the Bonanza site is the electric railroad. Deseret's preferred system for the Rangely site is the overland conveyor.

WATER SOURCE ALTERNATIVES

The Green and White Rivers in Utah and Colorado have been identified as alternative sources of water. Water would be pumped to the plant site through a 36-inch diameter pipeline. There is little known about ground water in the vicinity of the plant sites; however, test wells indicate that the water is of too low a volume and too poor a quality to be used for the project.

Water from the Green River would be removed through an off-stream system of collector wells and pumped to either the Bonanza or Rangely site. If water were taken from the White River in Utah, it would be withdrawn from the State of Utah's proposed White River Reservoir through a standard screened intake structure.

Water from the White River in Colorado would be used only at a Rangely plant. Water could be taken from one of two reservoirs (Taylor Draw or Wolf Creek) on the White River proposed by the Colorado River Water Conservation District (CRWCD) Water Users Association No. 1. The applicant-proposed water source for the Bonanza plant is the Green River. The applicant-preferred source for the Rangely plant is the Wolf Creek Reservoir.

Purchase of water by Deseret from Flaming Gorge Reservoir in Utah and from agricultural water rights in Colorado is also analyzed.

POWER TRANSMISSION SYSTEM ALTERNATIVES

Transmission system alternatives include both routing and system alternatives. In addition to the applicant-proposed route for the unit 1 345-kV line from the plant site to the Mona substation, other reasonable combinations of segments have been analyzed. Four alternative combinations have been identified for the future unit 2 345-kV transmission system to the Ben Lomond substation. One alternative route in addition to Deseret's proposed unit 1 138-kV system routes has been analyzed.

System alternatives include double circuiting, wheeling arrangements, tower sharing, and joint construction of transmission lines by Deseret and UP&L. With the exception of double circuiting, the feasibility of these system alternatives would be dependent upon successful private negotiations.

NO ACTION

The "No Action" alternative would involve the denial by Federal agencies of rights-of-way and other appropriate permits or the cancellation of the proposed project by Deseret. Such a decision could result from Federal agencies finding that it is in the public interest to deny the use of public lands or refuse a loan guarantee commitment for this project.

SUMMARY OF MAJOR ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVE AND THE PROPOSED ACTIONS

The following summary describes the impacts expected under a worst-case situation with construction of the two units assuming an 18-month delay between the first and second unit. Socioeconomic impacts presented for the plant sites also include the work force expected for the Deserado Mine and the electric railroad.

PLANT SITE ALTERNATIVES

The power plant would release pollutants into the atmosphere. Under worst-case analysis, all State and Federal standards would be met with 93.6-percent sulfur dioxide (SO_2) control at the Bonanza site and 94.9 percent control at the Rangely site. Future oil shale development could possibly be hindered because of use of Colorado Category I SO_2 increments at Dinosaur. Because of prevailing wind patterns, cumulative impacts from the Moon Lake project and oil shale development would more likely occur with a plant at Bonanza. There is insufficient data to determine the frequency of a visible plume, but under adverse meteorological conditions, a highly visible yellow-brown plume would be seen by visitors at Dinosaur. Impacts to visibility would probably occur less frequently from a Rangely plant than a Bonanza plant due to prevailing air flow patterns.

Withdrawal of water from the Green River could reduce the lowest recorded annual flow at Green River, Utah by 2 percent. Salinity, as measured in total dissolved solids, would increase by less than 0.8 milligrams per liter (mg/ℓ) in the Green River at Green River, Utah and 1 mg/ℓ in the Colorado River at Imperial Dam in California.

Riparian vegetation (82 acres at Bonanza and 77 acres at Rangely) would be disturbed and removed for the life of the project and beyond. The con-

tinued existence of any threatened or endangered plants would not be jeopardized. As indicated by the U.S. Fish and Wildlife Service (USFWS), withdrawals of water from the Green or White Rivers for this project is likely to jeopardize the continued existence of three endangered fish species in the Colorado River system. However, if water were purchased from Flaming Gorge, thus replacing water withdrawn from the Green River for the Moon Lake project, the endangered fishes would not be affected. Development of the Bonanza plant would disturb antelope during the critical fawning season and would occupy 4 percent (1,840 acres) of the critical antelope fawning area and 6 percent of the range of the Bonanza wild horse herd. The Rangely plant site would occupy 2,202 acres of antelope summer range, not identified as critical.

Several cultural resource sites would be disturbed, and some scientific and educational information could be lost. There are 8 known cultural resource sites on the Bonanza plant site and 21 on the Rangely site. None of those on the Bonanza site are eligible to the National Register of Historic Places (National Register) and only one on the Rangely site may be eligible.

Construction of a power plant at either site would be out of character with the existing landscape.

Regardless of the plant site selected, there would be an increased demand on the already limited middle-income housing supply of Vernal and Rangely. Both Vernal and Rangely would have to expand or improve existing sewer and water systems and additional police, firemen, and health care personnel would be needed. Additional teachers and facilities would be needed in both communities in order to maintain present ratios.

An imbalance in property tax revenues and per capita expenditures by Uintah and Rio Blanco Counties for the project-induced populations would occur. With the Bonanza plant site, Rio Blanco County would spend more for services than would be replaced by property tax on Deseret-owned facilities but would receive additional revenue from tax on the Deserado Mine and a Colorado State coal severance tax. With the Rangely plant site, Uintah County would support project-induced populations without any Deseret-related property tax base. This analysis does not account for personal property tax, sales tax, state income tax, etc., on individuals which would increase revenues to the counties.

With either plant site, Vernal and Rangely would experience an influx of newcomers that could alter the prevailing social order. However, the project area has experienced substantial energy-related growth since World War II. Therefore, it can be expected that the social impacts associated with a typical boom-town scenario would not be as great as in communities that have not experienced prior energy development.

COAL SOURCE ALTERNATIVES

With the Deserado Mine, subsidence and earth fractures may occur on about 5,100 surface acres above the mine. Changes would likely be subtle and unnoticed by the casual observer.

The water requirement of the mine operation would be equivalent to 0.06 percent of the average flow and 0.14 percent of the lowest recorded annual flow of the White River in Colorado. The water quality of the White or Green Rivers would not be altered.

About 120 acres of riparian vegetation would be eliminated. No threatened or endangered plant species would be affected by the Deserado Mine. No major impacts on terrestrial wildlife have been identified.

Withdrawal of water from the White River could jeopardize the continued existence of three endangered fish species during low-flow and drought conditions. However, if water normally withdrawn for irrigation were allowed to remain in the river, there would be no jeopardy to the species.

Forty-seven cultural sites, four of which may be eligible for the National Register, could be disturbed by ground disturbance or subsidence. Even with mitigation, some loss of scientific and educational information could occur.

The refuse disposal area would be out of character with the existing landscape.

The coal mine work force and population related impacts were presented with Plant Site Alternatives section.

Based on current estimates of coal reserves at the Deserado Mine, open market purchase of coal may be required for 15 years of the projected 35-year life of the project if additional Federal leases contiguous to the Deserado Mine are not obtained by Deseret.

The source for open market purchase of coal has not been definitely identified. The environmental impacts of coal mining on existing Federal leases along with the projected production of non-Federal coal have or will be analyzed in Regional Coal Environmental Impact Statements (EIS). Environmental statements that apply to the area where coal could be purchased include the Northwest Colorado Regional Coal EIS and Supplemental Reports prepared by BLM in 1977 and 1979; Development of Coal Resources in Central Utah prepared by the Department of Interior, 1979; Green River-Hamms Fork Regional Coal EIS, 1980; and Uinta-Southwestern Regional Coal EIS, 1980.

Impacts associated with open market purchase of coal would be from on-highway transport of coal as discussed in the Coal Transport section below.

COAL TRANSPORT ALTERNATIVES

All of the coal transport methods to either plant site would disturb small areas (up to 5 acres) of riparian vegetation and up to 21 cultural resource sites. One of the cultural resource sites along the railroad coal delivery conveyor may be eligible to the National Register. The continued existence of threatened or endangered plant species would not be jeopardized by any alternative.

Only the on-highway trucking alternative to the Bonanza site would create serious unavoidable adverse impacts to terrestrial wildlife. With this alternative, deer, sage grouse, and antelope mortality would increase on the affected highways. A slurry pipeline would utilize up to 0.62 percent of the lowest recorded annual flow from the White River.

With the on-highway truck haul to the Bonanza site, there would be approximately a 323-percent increase in daily traffic on Utah Highway 45 and up to 117 percent on the affected portion of U.S. 40. Trucks would create a safety hazard and several accidents per year could be expected. Highway damage with associated maintenance costs would increase. Noise levels at the Town of Dinosaur would increase to approximately 86 dBA (weighted sound level). Increases in frequency and magnitude of noise would occur.

WATER SOURCE ALTERNATIVE

Impacts on water quality and quantity of the Green and White Rivers with the Moon Lake project were presented in the discussion on the plant site alternatives. Anticipated impacts of construction of the Utah White River Reservoir, including impacts on endangered fish in the Colorado River system,

inundation of cultural resources and mining claims, and loss of recreation on the White River were presented in a Draft EIS completed by BLM in December 1980. Presented below are impacts that would be expected with construction of the Taylor Draw or Wolf Creek Reservoir and with purchase of agricultural water in the upper White River basin for use at the Rangely plant site. Additional engineering and environmental work would also be required for NEPA compliance before either reservoir could be built.

Water temperature would be reduced and natural flows would be altered below the dam. The dam would create a barrier and block the movement of fish including three endangered species in the White River. The endangered species would not utilize the altered habitat. About 50 acres of riparian vegetation would be inundated by the Taylor Draw Reservoir and 863 by the Wolf Creek Reservoir. No intensive inventories of threatened or endangered plants or cultural resources have been completed on either reservoir area. At least two known cultural resource sites would be disturbed or inundated by the Taylor Draw Reservoir, and two with Wolf Creek Reservoir, all of which may be eligible to the National Register.

About 400 acres of irrigated land along with four ranch houses would be inundated by either reservoir. This represents 20 percent of the irrigated land in Rio Blanco County. Of the 400 acres that would be inundated if the Taylor Draw Reservoir were built, 176 acres have been identified as prime (irrigated) farmland. This represents 7 percent of prime farmland along the White River near Rangely.

About 3,100 feet of Colorado Highway 64 would have to be relocated with the Taylor Draw Reservoir.

The Wolf Creek Reservoir would inundate a suspension bridge across the White River which carries an exposed natural gas pipeline.

If Deseret were to purchase agricultural water from the White River, the potential reductions in flow cannot be accurately predicted. The intent of this alternative is to prevent changes in the flow of the White River due to the Moon Lake project. However, irrigation water would be used only during the irrigation season and the winter flows of the river would still be altered by the project. Salinity in the river during the irrigation season (May through September) would be reduced through the elimination of irrigation return flows that are typically high in total dissolved solids.

Irrigation water may only be used on an as-needed basis to ensure adequate supplies of water during low flows in the river. Therefore, the frequency of need and the amount of agricultural land that would be retired cannot be accurately predicted. However, the amount of land retired could be significant since Deseret would require water equivalent to 47 percent of that presently used for irrigated agricultural land in the upper White River basin.

WATER TRANSPORT ALTERNATIVES

Construction of any of the water pipelines to the plant sites would disturb small areas of riparian vegetation (up to 6 acres) and up to three cultural resource sites. Of the sites that would be disturbed, only one, located along the Utah White River Reservoir to Bonanza pipeline, may be eligible to the National Register. Construction of the pipelines would not jeopardize the existence of any threatened or endangered plant or animal species. However, the corridor for the pipeline between the Green River and the Bonanza site would pass through the habitat of one plant species that has been proposed as threatened.

RECREATION-RELATED IMPACTS

Regardless of the plant site selected, recreation-related impacts from the project-induced population would occur within a secondary zone of influence. Most of these impacts would occur within a 2-hour driving distance from Vernal and Rangely. Impacts could include loss of scientific information from vandalism to paleontologic and cultural resources, poaching of an endangered cactus (Sclerocactus glaucus), harrassment and increased poaching and hunting of wildlife, increased fishing pressure, and overuse of recreational facilities. The impacts directly attributable to the project are expected to be small due to the occurrence of other projected developments.

TRANSMISSION SYSTEM ALTERNATIVES

All of the transmission system routing alternatives would have the same types of impacts but the magnitude would vary depending on the miles of each resource found along the routes. Unavoidable impacts would include localized erosion on severe erosion hazard areas, inadvertent destruction of threatened or endangered plants, disturbance of riparian and wet meadow vegetation, mortality of waterfowl and other birds from collision with conductors and towers, and loss of scientific and educational information due to disturbance of cultural resource sites.

Transmission lines would introduce a medium to high increment of contrast at highway crossings and aesthetic values would be reduced. Several alternative routes would be visible from recreational areas.

The applicant-proposed alternatives for unit 1 and 2 345-kV lines would have important land use and land use planning conflicts including loss of prime commercial timber production on the Ashley National Forest, introduction of new access into two off-road vehicle closure areas on National Forest land, a conflict with a planned scenic loop road, and encroachment into urban areas. Based on a minimum sale price of $2.00 per 1,000 board feet, timber valued at $5,074 would be cut during the construction period and an annual loss of $304 in timber production would continue for the life of the project.

NO ACTION ALTERNATIVE

With the No Action alternative, a continuation of current environmental and socioeconomic growth trends would still be expected in the Vernal-Rangely region. However, if power supplies were insufficient, it could be detrimental to the overall welfare of the customers affected.

With delay, the cost of the Moon Lake project could increase by about $30 million per year. If available, after March 1985, Deseret's cost for power purchased from UP&L could increase 20 to 40 percent. If power were available for purchase on the open market beyond 1985, the price of power to Deseret could increase as much as 300 percent (in 1980 dollars).

REGULATORY COMPLIANCE WITH SELECT LAWS AND EXECUTIVE ORDERS

The Federal Clean Air Act was enacted to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population. The National Ambient Air Quality Standards (NAAQS) are limits on concentrations of specific pollutants

and were set to protect human health and the public welfare. Prevention of Significant Deterioration (PSD) increments were set for certain pollutants to limit deterioration of air quality in areas with lower pollution levels than the NAAQS. All areas which could be affected by the applicant's proposal are designated as Federal PSD Class II areas. Class II areas allow air quality deterioration associated with moderate, well controlled growth. The Moon Lake project units 1 and 2 would comply with Class II incremental limitations and the NAAQS, and all other provisions of the Federal Clean Air Act.

Executive Order 11988: Floodplain Management requires each Federal agency to consider flood hazards and floodplain management factors in carrying out or assisting any project located in a floodplain or impacting a floodplain. The water supply system would be the only project-related components affecting a floodplain. The impact of the collector-well system on the Green River floodplain would be minimal. Construction of water storage reservoirs of the White River in Colorado would permanently inundate floodplain areas upstream from the two impoundments.

Executive Order 11990: Protection of Wetlands directs Federal agencies to avoid to the extent possible the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. BLM Manual 6740-Wetland-Riparian Area Protection and Management-establishes policy and procedures for the identification, protection, maintenance, enhancement, and management of the various wetland and riparian areas. The manual ensures that all wetlands-riparian areas, their unique characteristics, and their ecological requirements are managed in accordance with legislative, executive, departmental, and secretarial directions.

Acreages of riparian habitat that would be impacted by the power plant and raw material supply system alternative sites are given in table 4-9.

The loss of riparian acreage at the Bonanza or Rangely plant site, Deserado Mine and refuse disposal area, and the Wolf Creek and Taylor Draw Reservoirs would be mitigated to the extent possible. Some of the alternative transmission line segments cross riparian/wetland areas. Careful siting of centerline and placement of transmission tower bases would mitigate any potential adverse impacts.

The Endangered Species Act was enacted to provide for the conservation of threatened and endangered species of fish, wildlife, and plants, and to provide a means whereby the ecosystems upon which threatened and endangered species depend may be conserved.

A single specimen of an officially listed threatened plant species occurs along the applicant-proposed Green River to Bonanza water pipeline route. The formal biological opinion of the USFWS states that this species would not be adversely affected by this project.

The Moon Lake project would impact the Green or White Rivers by reducing flows. The formal biological opinion of the USFWS states that the Moon Lake project, as proposed, is likely to jeopardize the continued existence of the Colorado squawfish, the humpback chub, and the bonytail chub. However, if water were purchased from Flaming Gorge Reservoir and remained in the Green River, thus replacing water withdrawn from the collector-well system and if this make-up water were released on a daily basis from Flaming Gorge equal to the amount being diverted for the Moon Lake project, the endangered fishes would not be affected.

The only potential threat to terrestrial threatened or endangered species from the Moon Lake project proposal would be caused by transmission lines crossing major flyways of the bald eagle and/or the whooping crane. Birds

could collide with the lines but this impact would be mitigated by marking the lines to make them more visible. The official opinion of the USFWS is the Moon Lake project would not jeopardize the continued existence of these species.

The Wild and Free-Roaming Horse and Burro Act authorizes and directs the Departments of Interior and Agriculture to protect and manage wild free-roaming horses and burros as components of the public lands ... in a manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands. The development of the Bonanza site would occupy approximately 6 percent of the range of the Bonanza wild horse herd. The impact would not result in the loss of any wild horses.

The Wilderness Act, as amended, requires inventory and review of roadless areas of 5,000 acres or more identified as having wilderness characteristics described in the Act. The proposed action and alternatives to the action do not affect or impact any lands designated as wilderness or currently under wilderness review.

The Wild and Scenic Rivers Act requires each Federal agency to avoid or mitigate adverse effects on rivers identified in the Nationwide Inventory prepared by the Heritage Conservation and Recreation Service. Agencies are required to consult with the Heritage Conservation and Recreation Service prior to taking actions which could conflict with wild, scenic, or recreational river status on rivers in the Inventory. The proposed and alternative transmission systems would cross the Green and White Rivers and could conflict with the status of these rivers, currently being considered in the Nationwide Rivers Inventory.

Consultation with the Heritage Conservation and Recreation Service by BLM, REA, and Deseret prior to transmission line construction has been identified by Heritage Conservation and Recreation Service as adequate mitigation.

The National Historic Preservation Act is designed to protect properties included in or eligible for inclusion in the National Register through review and comment by the Advisory Council on Historic Preservation on Federal undertakings that affect such properties.

The State Historic Preservation Officers in Utah and Wyoming and the BLM have consulted and agreed to the measures which should be undertaken to protect cultural values should authorization be granted to use public lands administered by the BLM for the purpose of any of the actions discussed in this Draft EIS. This agreement is authorized under the Federal Land Policy and Management Act and the National Historic Preservation Act.

Impacts to sites that may be affected by the project would be mitigated in accordance with measures agreed to by BLM and the affected states. The Colorado State Historic Preservation Officer has been advised of the project and its impact potential and has indicated a desire to review the Draft and Final EISs.

The Land and Water Conservation Fund Act directs that property acquired or developed with assistance from the Fund shall not be converted to other than public outdoor recreation uses without the approval of the Secretary of the Interior. The Secretary of the Interior shall approve such conversion only if it is found to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such condition as deemed necessary to assure the substitution of other recreation properties of at least fair market value and of reasonably equivalent usefulness and location. Depending upon the centerline location of transmission lines, the proposed or alternative transmission systems could conflict with designated park and recreation areas. Right-of-way impingements to aqueduct, canal, and reservoir

systems could also occur. Correct placement of transmission lines within the 1-mile-wide corridor would mitigate these impacts.

Secretary of Agriculture Memorandum No. 1827 Revised (Statement on Land Use Policy) states that major consideration must be given to important farm, range, and forestlands, and the long-range need to retain the productive capacity and environmental values of American agriculture and forestry. Land use alternatives must be explored that would minimize impacts on important farm, range, and forestlands, and, where possible, avoid decisions which irrevocably commit important lands to non-farmland, non-rangeland uses, thereby foreclosing the options of future generations. Approximately 400 acres of agricultural land would be inundated if either the Taylor Draw or Wolf Creek Reservoir water supply alternatives were selected with the Rangely plant site. Of the 400 acres that would be inundated if the Taylor Draw Reservoir were built, 176 acres have been identified as prime (irrigated) farmland. No prime farmlands have been identified in the Wolf Creek Reservoir area. Project-related urban expansion in Vernal could displace up to 29 acres of agricultural land (not prime by SCS standards).

Some of the 345-kV transmission route alternatives would cross varying amounts of agricultural lands; the maximum amount on any one complete route would be approximately 26.5 miles, some of which may be prime or unique farmland. However, agricultural activities would only be temporarily disrupted if the construction period were to occur during the season of use. During the life of the project, agriculture and grazing could continue within the transmission system right-of-way and therefore, would not be substantially affected. Also, the amount of land taken out of production (900 square-feet per 345-kV tower base) by the tower structures, although minimal, could be further minimized by proper placement of the towers within the 1-mile-wide corridor.

Although no prime grazing lands have been identified, sheep grazing allotments would be impacted by the power plant and raw material supply alternatives. The applicant-proposed Bonanza plant site would cause a forage loss of 150 animal unit months (AUMs). The Rangely alternative plant site would cause a forage loss of 112 AUMs. The applicant-proposed Deserado Mine portal area and refuse disposal area would cause a forage loss of 84 AUMs. The Taylor Draw Reservoir alternative water source would inundate 6 AUMs of forage and Wolf Creek 167 AUMs. Approximately 2,537,000 board feet (valued at $5,074) of commercial timber would be affected during the construction of the proposed unit 2 transmission line in segment 35. Up to 652,000 board feet (valued at $1,304) would be affected with construction of alternative segment 37. Timber production within the right-of-way would be lost for the life of the project.

In most cases, impacts on agricultural, grazing, and forest lands would be minimized to the extent practical.

Secretary of Agriculture Memorandum No. 1162 Supplement 8 (Civil Rights Considerations of Policy Actions) provides a mechanism whereby discrimination in proposed major policy actions can be detected and ameliorated before implementation. Components of the proposed project may cross Uinta-Ouray Reservation lands and may affect the Ute Tribe living within the two-county impact zone.

No significant adverse impacts from the proposed construction of an extra high voltage (EHV) transmission line across Ute lands have been identified. Deseret has adopted a board resolution providing for non-discrimination in employment with reference to race, color, sex, and national origin. Deseret would adopt an "Affirmative Action Program."

Deseret has contacted the Ute Indian Tribal Business Committee to determine their interest in providing construction workers as well as training future power plant operators. Deseret has provided a list of potential skills and positions to the Uinta Basin Vocational Center and is considering the possibility of developing a training and education program to prepare members of the Tribe for employment.

The proposed action would have no significant civil rights impact; therefore, no civil rights impact statement is required.

UNRESOLVED ISSUES AND AREAS OF CONTROVERSY

The following issues associated with development of the proposed Moon Lake project remain unresolved:

1. Air Quality: reliability of modeling to predict impacts.

2. Water Supply: the availability of a timely, reliable water supply for the Rangely plant site.

3. Endangered Species: whether withdrawal of 30 cfs from the Green or White Rivers for the Moon Lake project would jeopardize the continued existence of fish species in those rivers.

4. Socioeconomics: there is a controversy over a potential imbalance of property tax revenues to be derived from Deseret-owned facilities and expenditures by Uintah County, Utah and Rio Blanco County, Colorado to provide services for the project-induced population. The magnitude of the imbalance is difficult to predict and assumptions in the predictive models are a point of controversy.

AIR QUALITY

No on-site air quality data has been collected and no existing data has been shown to be representative of either plant site. The Environmental Protection Agency (EPA) Valley Model (EPA, 1977a), generally considered to be conservative, was used as a screening technique to determine whether additional, more detailed modeling would be needed. The Valley Model has shown that under worst-case meteorological conditions, 93.6-percent control of SO_2 would be required at the Bonanza site to meet Colorado Category I limitations and 94.9 percent would be required with the Rangely site. These levels of control have not been conclusively demonstrated as feasible but, after preliminary review of Deseret's proposed technology, EPA has stated that they see no reason why these levels cannot be achieved on a continuous basis (Appendix 1). If EPA were to require additional modeling before issuance of a PSD permit, it would be required for either plant site.

WATER SUPPLY

Timing of the Rangely Reservoir project (Taylor Draw or Wolf Creek Reservoir) as a water supply for the Rangely plant site has been a continuous issue between Deseret and Colorado interests. Applications for the Taylor Draw portion of the Rangely Reservoir project have been filed with BLM and the U.S.

Army Corps of Engineers by Water Users Association No. 1 of the CRWCD but no completion dates for NEPA compliance or the reservoir have been finalized. It is expected that the reservoir project would be delayed until January 1982 for USFWS determination of impacts on threatened and endangered fish in the Colorado River system.

The availability of water for the Rangely plant site is also controversial. The amount of water that can be made available to the project from the White River in Colorado depends on the amount of future water development and the amount of water that must be released from Colorado into Utah.

Estimates of future water use from the White River in Colorado require consideration of conditional water rights senior in priority to the water rights that Deseret could obtain. Under Colorado water law there are two basic types of water rights, absolute and conditional (see Glossary). Any conditional water right senior in priority to those available to Deseret may be developed subsequent to construction of the power plant, and the holder of such senior right would be entitled to use all of the water granted under his right even if such use reduced or completely depleted the water available for the project.

Controversy arises over assumptions on "reasonable" levels of future water use for Deseret's project. Deseret's position is that a guaranteed source of water for the entire life of the project must be available and future use could reduce the amount of water available for Deseret's use. The State of Colorado and Water Users Association No. 1 believe that water rights held by or offered to Deseret are of sufficiently early priority to guarantee water for the project over its entire life. However, REA and Deseret do not agree with this position.

It is not known whether Colorado would be obligated to honor a water right granted to the Ute Tribe in Utah by the Winter's Doctrine which is a Federal decree given in 1882. The Winter's Doctrine does not specify a definite amount of water but ensures that the Ute Tribe in Utah has a right to substantial quantities of irrigation water from the White River. The amount of water is not yet agreed upon by the Ute Tribe and the priority date of the Ute water rights is not firmly established, but will most likely be either 1882 or 1948, possibly earlier in priority than conditional water rights held by Deseret or a perfected right offered to Deseret by the Town of Rangely.

Water Users Association No. 1 has stated that a 16 cfs water right offered to Deseret by the Town of Rangely would be more than sufficient to satisfy the water requirements of the first generating unit should it come on line prior to completion of the Taylor Draw Reservoir. There is also question as to whether water could be pumped directly from the White River or whether a reservoir would be required to supply the project. December through February are generally the lowest flow months on the White River. To determine the feasibility of pumping directly from the White River without a reservoir, an annual daily and 2-week low-flow frequency analysis of the White River at the Utah-Colorado state line was made (Hansen, 1980a). Based on annual daily low flow, without any on-site water storage and without any further priority water right developments, and further assuming that the river could be completely dewatered, there would be insufficient water for the Moon Lake project about 1 in every 40 years. There would be about a 2-week supply of water stored on the plant site in a raw water storage pond. Based on the annual 2-week low-flow frequency, without any further priority water rights development and assuming that the river could be completely dewatered, the probability of insufficient water for the project would be approximately 1 year in every 100 years. If Colorado were required to release water into Utah to meet the Ute

Tribal water rights, July and August would be critical periods. If Ute Tribal water rights are met during these months, there may be insufficient water 1 year in 7 during July and 1 year in 8.5 during August. Deseret feels that this is not a reliable source of water.

Water could potentially be supplied to the Rangely site in Colorado via pipeline from the Green River in Utah from a 30 cfs water right (Application No. 31368, 1959) held by Deseret. Whether or not the transfer could be made is controversial (see Appendix 2).

The policy of the State of Utah will not allow the transfer of water for this project, even though such a transfer may be legally possible.

ENDANGERED SPECIES

The USFWS is involved in a study on the Green and White River systems to determine the distribution, essential habitat, limiting factors, and flow requirements of three endangered fish species in the river. The critical flow requirements are not known at this time. Until the study is completed in January 1982, all official biological opinions on water withdrawal without approved mitigating measures or alternatives will state that the withdrawal from the Green or White River could jeopardize the continued existence of these fish.

This opinion is not agreed upon by all experts. The position of the Utah Department of Health, the Utah Division of Wildlife Resources, and Bio/West (environmental consultant firm in Logan, Utah) is that in and of itself the withdrawal of 30 cfs from the Green or White Rivers for the Moon Lake project would not jeopardize the continued existence of the fish species. However, along with the cumulative impacts from other projects, their existence could be jeopardized.

SOCIOECONOMICS

There is a controversy over a potential imbalance of property tax revenues to be derived from Deseret-owned facilities and expenditures by Uintah and Rio Blanco Counties to provide services for the project-induced population, i.e., who gets the tax base. The magnitude of the imbalance is difficult to predict and assumptions in the predictive models are a point of controversy.

If the power plant were built at the Bonanza site, Uintah County would receive funds in excess of expenditures and Rio Blanco County would likely fall short in meeting community service demands. However, shortfalls would be offset somewhat through a coal severance tax that would be assessed to Deseret by the State of Colorado. Regardless of the site selected, Rangely would have the tax base of the Deserado Mine.

If the power plant were built at the Rangely site, Uintah County would receive no property tax revenue from tax on Deseret-owned facilities but would have to meet community service demands of the project-induced population that would live in the county.

The socioeconomic models used to project the number and distribution of the project-induced population have been controversial. Population projections presented in this Draft EIS have been independently reviewed by BLM and found to be reasonable. However, Colorado interests believe that estimates of the influx of people into Colorado are too low.

CHAPTER 1
THE PURPOSE AND NEED OF THE PROPOSED ACTION

INTRODUCTION

In accordance with the National Environmental Policy Act of 1969 (NEPA) (Public Law 91-190,1970), the Bureau of Land Management (BLM), U.S. Department of Interior (USDI), and Rural Electrification Administration (REA), U.S. Department of Agriculture (USDA), acting as joint-lead agencies, have prepared this document in response to the filing of right-of-way applications by the Deseret Generation and Transmission Cooperative (Deseret) for use of public land and an application by Deseret to REA for a loan guarantee commitment to facilitate project financing. Deseret proposes to use public lands in northeastern Utah and northwestern Colorado to develop the 800-megawatt (MW) Moon Lake power plant project (Moon Lake project), units 1 and 2 at the Bonanza site.

This chapter identifies the purpose and need of the proposed project, the scoping procedures that were used in determining the more significant issues, those issues, and interrelationships between projects which could cause cumulative impacts. Major Federal Authorizing Actions required for this project are listed in Appendix 3.

PURPOSE AND NEED FOR THE PROJECT

Deseret, headquartered in Murray, Utah, was formed in 1978, and consists of six rural electric distribution cooperatives. These cooperatives are listed in table 1-1 and their service areas are shown in figure 1-1.

In 1979, the total number of customers served was approximately 24,945, with a noncoincident peak demand of 166.9 MW. Only Garkane Power Association and Moon Lake Electric Association (MLEA) have generating capacity. Garkane produces 3.0 MW of hydroelectric power and MLEA produces 0.5 MW of hydroelectric power. The balance of load and reserve requirements is purchased mainly from the Department of Energy's Western Area Power Administration (WAPA) and Utah Power and Light Company (UP&L).

Power purchases from WAPA are limited due to Colorado River Storage Project (CRSP) capacity limitations and the rest of Deseret's shortfall is acquired from UP&L at average system costs. Power requirements in excess of contracted amounts, if available, are provided by UP&L at unit cost plus a demand charge. In a June 1, 1979, Utah Public Service Commission (PSC) Order, UP&L was directed to terminate its wholesale power sales agreements with members of Intermountain Consumers Power Association (ICPA). Therefore, Deseret or its members cannot rely on UP&L for an adequate and reliable power supply beyond 1985, and the purchased power costs would be significantly increased at that time. Appendix 4 provides additional information on the PSC order and its potential results.

NEED FOR POWER

Deseret prepared a Power Requirement Study (PRS) which was completed in October 1978. It was revised by Deseret and reviewed by REA for approval in 1980. The load projections contained in the PRS reflect an analysis of historical growth trends and anticipated future use characteristics, energy

TABLE 1-1

The Rural Electric Distribution Cooperative
Members of Deseret Generation and Transmission Cooperative

Member Cooperatives	Headquarters	Rural Electrification Administration Designation	Customers[a]
Bridger Valley Electric Association	Mt. View, Wyoming	Wyoming 9 Uinta	3,479
Dixie-Escalante Rural Electric Association	Beryl Junction, Utah	Utah 20 Iron	1,579
Flowell Electric Association	Fillmore, Utah	Utah 11 Millard	356
Garkane Power Association	Richfield, Utah	Utah 6 Garfield	4,387
Moon Lake Electric Association	Roosevelt, Utah	Utah 8 Duchesne	10,008
Mt. Wheeler Power, Inc.	East Ely, Nevada	Nevada 19 White Pine	5,136
		Total	24,945

[a]REA Bulletin 1-1, 1979 Annual Statistical Report.

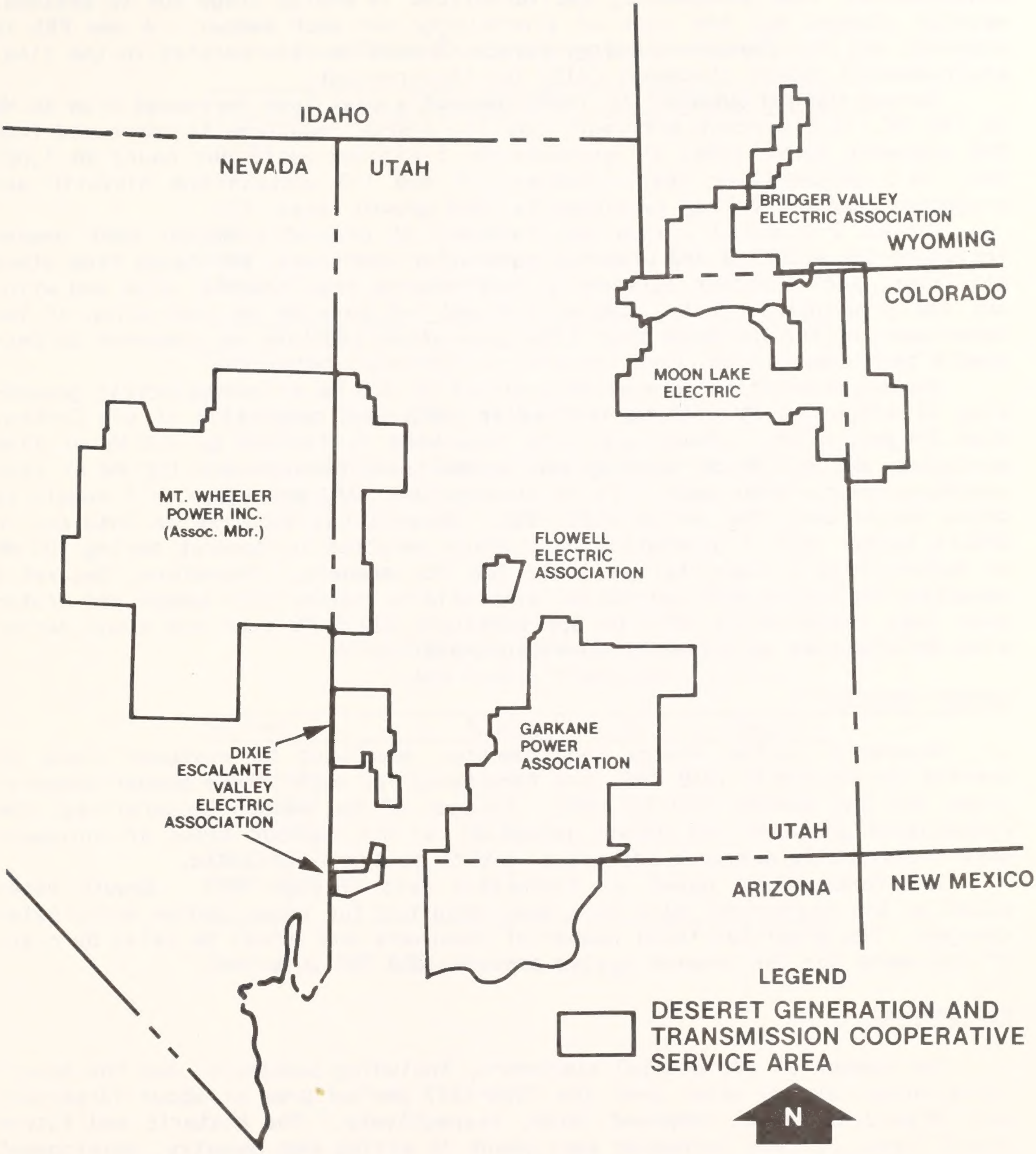


FIGURE 1-1

SERVICE AREA OF DESERET GENERATION AND TRANSMISSION COOPERATIVE

conservation, load management, and variations in energy usage due to seasonal weather changes and the cost of electricity for each member. A new PRS is underway and its power and energy forecasts will be incorporated in the final environmental impact statement (EIS) for this project.

During the period 1967 to 1977, Deseret's peak load increased from 48 MW to 156 MW, 12.5 percent per year; and its energy requirements increased from 268 gigawatt hours (GWh) (1 gigawatt is 1 billion watts per hour) to 1,020 GWh, 14.3 percent per year. Tables 1-2 and 1-3 contain the historic and projected demands, energy requirements, and growth rates.

Tables 1-4 and 1-5 show the forecast of Deseret's annual peak demand including the existing and proposed generation additions, purchases from other utilities, participation agreements, and reserve requirements, with and without the proposed project. Tables 1-4 and 1-5 provide an indication of the importance of the proposed Moon Lake generation addition as compared to Deseret's peak demand.

Deseret's existing generation consists of 3.5 MW of hydroelectric generation of which 0.5 MW will be retired in 1985 upon completion of the Central Utah Project (CUP). Power available from WAPA is limited to 112 MW of firm purchases and 8.5 MW of peaking over summer peak periods and 102 MW of firm purchases over winter peak. It is assumed that WAPA purchases will remain at these levels over the period 1980-1992. Deseret has acquired an interest in UP&L's Hunter Unit 2 generating unit which resulted in Deseret having 100 MW of Hunter Unit 2 capacity available for its members. Therefore, Deseret's capacity, including WAPA purchases, available to supply it's summer and winter peak load requirements will be approximately 223.0 MW over the study period with deficiencies satisfied by power purchases.

ENERGY FORECAST

Deseret's system energy requirements, developed by customer class of service in Deseret's 1978 PRS, are forecasted for each of its member cooperatives for the period 1977 to 1992. In each of the member cooperatives, the consumption patterns and growth potential of the various types of consumers were individually analyzed and actual growth patterns reflected.

The forecast is based on historical data through 1977. Growth rates based on the historical data have been adjusted for known and/or anticipated changes. The predicted total number of consumers and annual MW sales by class of consumers for the Deseret system are provided in table 1-6.

Residential

The number of residential customers, including seasonals, and the associated annual energy sales over the 1968-1977 period grew at about 13-percent and 18-percent annual compound rates, respectively. The historic and future growth rates reflect increased employment in mining and industry, development of recreation areas, and growth in the number of all-electric homes. The total number of residential consumers and the associated energy sales for the Deseret system are projected to increase at annual compound growth rates of 7.3 percent and 11.5 percent, respectively, over the period 1977 to 1982; and at annual rates of 6.9 percent and 9.5 percent, respectively, over the period 1982 to 1987.

TABLE 1-2

Peak Demand[a] and Energy Requirements[b]

Year	Demand (MW)	Energy (GWh)
1967[c]	48	268
1972	82	457
1977	156	1,020
1982	257	1,667
1987	361	2,262
1992	441	2,748

[a]Estimated coincidental seasonal peak demand.

[b]Includes losses and sales for resale.

[c]Years prior to 1970 exclude data for Mount Wheeler.

TABLE 1-3
Annual Growth Rate for Demand
and Energy--Percent

Period	Demand	Energy
1967-1972	11.3	11.3
1972-1977	13.7	17.4
1977-1982	10.5	10.3
1982-1987	7.0	6.3
1987-1992	4.1	4.0

Source: 1978 PRS, Deseret.

TABLE 1-4

Deseret Member Forecast of Peak Demand and Capacity Requirements
Without Moon Lake Project

	MW						
Year	Peak Demand	Reserve Requirements[a]	Load Requirements	Generation[b]	Power Purchases[c]	Capacity Available	Capacity Excess (Deficiency)
1980	210.5	8.6	219.1	103.5	168.5	272.0	52.9
1981	232.7	8.6	241.3	103.5	190.5	294.0	52.7
1982	257.3	8.6	265.9	103.5	215.5	319.0	53.1
1983	275.3	9.9	285.2	103.5	225.5	329.0	43.8
1984	294.5	31.0	325.5	103.5	120.5	224.0	(101.5)
1985	315.1	34.5	349.6	103.0	120.5	223.5	(126.1)
1986	337.1	38.3	375.4	103.0	120.5	223.5	(151.9)
1987	360.5	42.2	402.7	103.0	120.5	223.5	(179.2)
1988	375.2	44.7	419.9	103.0	120.5	223.5	(196.4)
1989	390.5	47.3	437.8	103.0	120.5	223.5	(214.3)
1990	406.5	50.0	456.5	103.0	120.5	223.5	(233.1)
1991	423.1	52.9	476.0	103.0	120.5	223.5	(252.5)
1992	440.5	55.8	496.3	103.0	120.5	223.5	(272.8)
1993	465.3	60.1	525.4	103.0	120.5	223.5	(301.9)
1994	491.5	64.5	556.0	103.0	120.5	223.5	(332.5)
1995	519.2	69.2	588.4	103.0	120.5	223.5	(364.9)
1996	548.4	74.2	622.6	103.0	120.5	223.5	(399.1)
1997	579.3	79.4	658.7	103.0	120.5	223.5	(435.2)
1998	612.0	85.0	697.0	103.0	120.5	223.5	(473.5)

Sources: Deseret and Burns and McDonnell.

[a]Reserves equal 17 percent of peak demand less firm purchase.

[b]Reflects Deseret's interest in UP&L's Hunter Unit No. 2.

[c]Includes WAPA - 112.0 MW firm purchase - 1980-1998.
8.5 MW peaking capacity - 1980-1998.
UP&L - firm purchases
48 MW in 1980, 70 MW in 1981, 95 MW in 1982, 115 MW in 1983.

Small Commercial and Industrial (SC&I)

Most SC&I customers provide goods and services to the residents in their surrounding area. SC&I sales grew at an annual compound rate of more than 16 percent during the period 1968 to 1977. Projected sales are expected to increase at compound rates of 8.3 percent, 6.5 percent, and 4.1 percent, respectively, for the periods 1977-1982, 1982-1987, and 1987-1992. The decrease in the growth rate in latter years reflects saturation of retail establishments in the service area.

Large Commercial and Industrial (LC&I)

Energy sales for this customer classification grew at a compound growth rate of over 12 percent between 1968 and 1977, much of which reflects extensive oil well development. Sales to oil companies with producing wells were 217.5 GWh, 36 percent of total LC&I sales in 1977. These sales are expected to increase only moderately in response to the development of new wells in the service area of Mt. Wheeler and secondary and tertiary recovery methods in existing fields in the service areas of Mt. Wheeler and MLEA. In 1987, sales to companies with producing oil wells are projected at 257.8 GWh, 15.9 percent of total LC&I sales.

The potential development of the Alton and Kaiparowits coal fields in the service territory of Garkane Power and the development of White River and Rio Blanco Oil Shale projects in the area supplied by MLEA could significantly add to Deseret's power as indicated in table 1-7.

TABLE 1-7

Future Power Requirements

	GWh		
	1982	1987	1992
Coal Fields	0	200.2	224.6
Oil Shale	128.5	124.0	260.0
Total	128.5	324.2	484.6
Percent of Total LC&I	12.5	23.0	29.9

Source: Deseret's 1978 PRS.

These developments could also increase the power requirements of the residential and small commercial consumer class.

PEAK LOADS

During the period 1967 to 1977, Deseret's peak load increased at a compound rate of 12.5 percent. Projected peaks are expected to grow at a compound annual rate of 10.5 percent from 1977 to 1982, and 7.0 percent from 1982 to 1987, reaching 361 MW in 1987.

The peak load forecast does not reflect the potential mining and oil shale developments which are foreseen in the service area over the next decade.

GENERATION PLANNING

To assist Deseret in its planning, a Preliminary Power Cost Study was prepared in February 1980.

Based on the results of that study, it was concluded that a power supply plan involving development of the Moon Lake power plant and associated transmission system is the most economical and reliable resource plan. Further, it recommended that Deseret conclude its participation agreement with UP&L in the Hunter 2 project as soon as practical and that Deseret enter into contractual arrangements to sell any surplus capacity and/or energy in the regional bulk power supply market.

Cancellation or delay of the Moon Lake power plant beyond 1985 would adversely affect Deseret's ability to provide adequate economic power and energy to its members in view of the June 1, 1979, Utah Public Service Commission Order.

THE SCOPING PROCESS

Three scoping meetings have been held by BLM-REA and Deseret to identify the significant issues related to the project. These meetings were held at Ft. Duchesne, Utah, on May 29-31, 1979; Rangely, Colorado, on September 10, 1979; and Vernal, Utah, on September 11, 1979. The meetings held in Rangely and Vernal were for the general public. The meeting held at Fort Duchesne was for local, State and Federal agencies.

In addition to the formal scoping meetings, numerous contacts have been made with various agencies and individuals. Additional public meetings on transmission line routing issues and alternatives were held by BLM and the U.S. Forest Service in Salt Lake City, Utah, on January 16, 1980 and Price, Utah, on January 17, 1980.

The major issues identified in the scoping meetings are:

1. Cumulative population impacts with White River Reservoir and oil shale development related population growth.

2. The socioeconomic impacts of the project and comparative capability of Vernal and Rangely to support the required population expansion.

3. The tax base problems if the plant were built in Utah but workers live in Rangely, Colorado and vice versa.

4. How tax base would be used to mitigate impacts.

5. Use of funds from the oil shale trust fund for mitigation of economic impacts.

6. Socioeconomic impacts in Roosevelt, Utah.

TABLE 1-5

Deseret Member Forecast of Peak Demand and Capacity Requirements
With Moon Lake Unit 1

	MW						
Year	Peak Demand	Reserve Requirements[a]	Load Requirements	Generation[b]	Power Purchases[c]	Capacity Available	Capacity Excess (Deficiency)
1980	210.5	8.6	219.1	103.5	168.5	272.0	52.9
1981	232.7	8.6	241.3	103.5	190.5	294.0	52.7
1982	257.3	8.6	265.9	103.5	215.5	319.0	53.1
1983	275.3	9.9	285.2	103.5	225.5	329.0	43.8
1984	294.5	31.0	325.5	103.5	120.5	224.0	(101.5)
1985	315.1	34.5	349.6	463.0	120.5	583.5	233.9
1986	337.1	38.3	375.4	463.0	120.5	583.5	208.1
1987	360.5	42.2	402.7	463.0	120.5	583.5	180.8
1988	375.2	44.7	419.9	463.0	120.5	583.5	163.6
1989	390.5	47.3	437.8	463.0	120.5	583.5	145.7
1990	406.5	50.0	456.5	463.0	120.5	583.5	126.9
1991	423.1	52.9	476.0	463.0	120.5	583.5	107.5
1992	440.5	55.8	496.3	463.0	120.5	583.5	87.2
1993	465.3	60.1	525.4	463.0	120.5	583.5	58.1
1994	491.5	64.5	556.0	463.0	120.5	583.5	37.5
1995	519.2	69.2	588.4	463.0	120.5	583.5	(4.9)
1996	548.4	74.2	622.6	463.0	120.5	583.5	(39.1)
1997	579.3	79.4	658.7	463.0	120.5	583.5	(75.2)
1998	612.0	85.0	697.0	463.0	120.5	583.5	(153.5)

Sources: Deseret and Burns and McDonnell.

[a]Reserves equal 17 percent of peak demand less firm purchase.

[b]Reflects Deseret's interest in UP&L's Hunter Unit No. 2.

[c]Includes WAPA - 112.0 MW firm purchase - 1980-1998.
8.5 MW peaking capacity - 1980-1998.
UP&L - firm purchases
48 MW in 1980, 70 MW in 1981, 95 MW in 1982, 115 MW in 1983.

TABLE 1-6

Forecasted Number of Consumers and Annual KWh Sales
By Class of Consumer: Utah 21 Deseret

	1977		1982		1987		1992	
	KWh	Consumers	KWh	Consumers	KWH	Consumer	KWH	Consumer
Residential	147,594	17,481	254,723	24,829	401,550	34,590	582,705	45,706
Irrigation	86,603	1,138	114,148	1,369	129,631	1,517	145,933	1,660
Security Lights	160	(208)[a]	102	(120)	153	(180)	229	(269)
Small Commercial	64,082	3,187	95,279	4,022	130,393	4,781	159,068	5,299
Public Streets and Highway Lighting	2,136	117	2,397	120	2,500	125	2,655	131
Public Building	5,304	239	7,174	283	8,192	299	9,265	315
Large Commercial	598,428	868	1,027,886	1,000	1,407,082	1,121	1,623,546	1,180
Borrowers Own Use	2,175	(5)	2,881	(5)	3,631	(5)	4,301	(5)
Sale for Resale	21,717	2	25,002	2	2	1	2	1
Total Sales	928,559	23,032	1,529,592	31,625	2,083,134	42,434	2,526,583	54,292
Requirements Including Losses	1,020,200		1,666,541		2,262,490		2,747,606	
Percent Losses	9.0%		8.2%		7.9%		8%	

Source: Deseret's 1978 PRS.

[a]Numbers in parentheses were not included in the totals.

[a]Numbers in parentheses were not included in the totals.

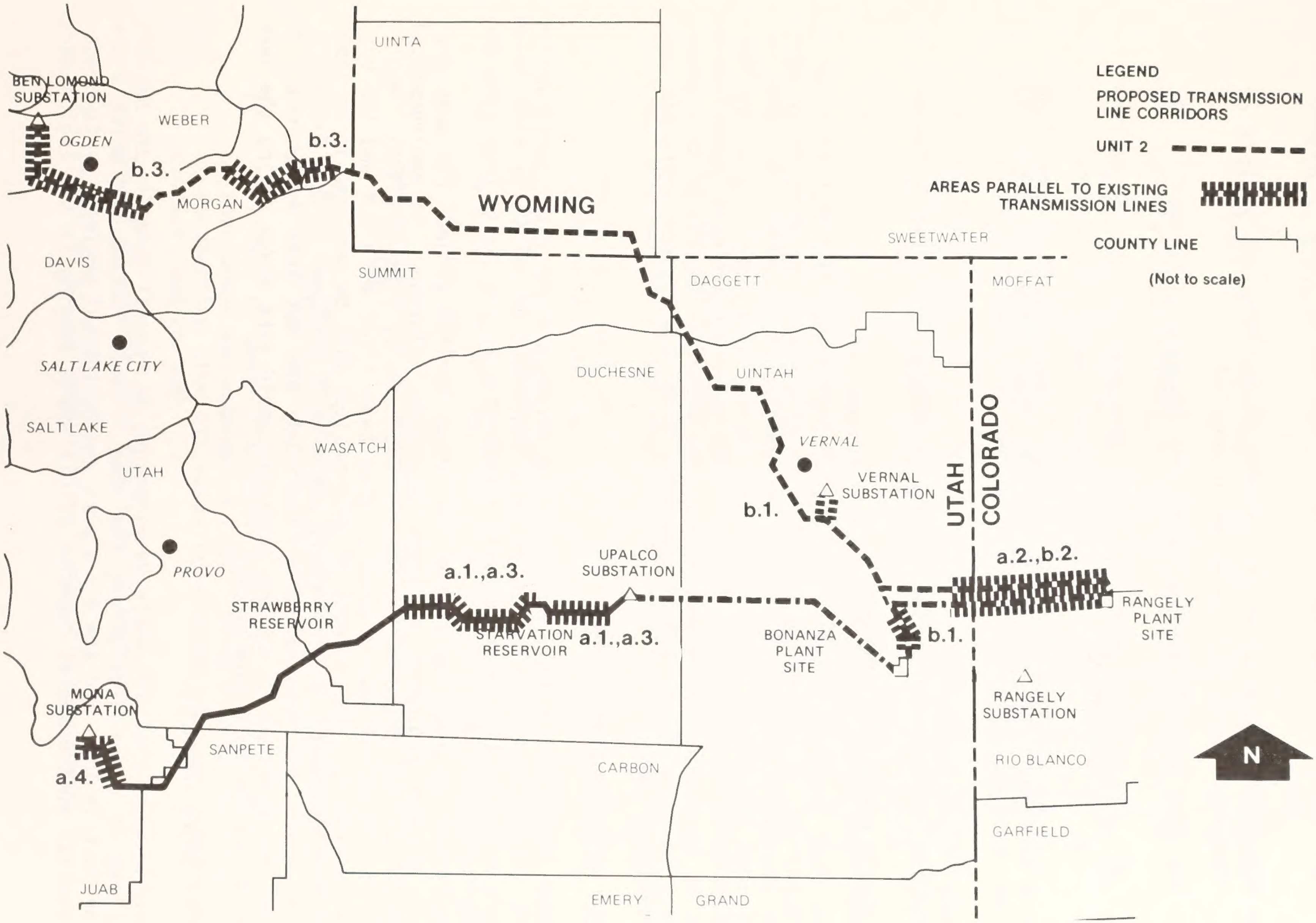


FIGURE 1-2

INTERRELATIONSHIPS OF THE PROPOSED MOON LAKE TRANSMISSION LINE CORRIDORS

4. Existing UP&L 44-kV, 138-kV, and 345-kV lines in segment 24.

b. Deseret's proposed transmission corridor from the Bonanza or Rangely site to Ben Lomond would parallel:

1. An existing MLEA 69-kV line in segments 32 and 34.

2. An existing Water and Power Resources Service 138-kV line in segment 26.

3. An existing UP&L 230-kV line in segments 35 and existing UP&L 230-kV (2), 138-kV (3), and 345-kV (1) lines in segment 31.

Regional transmission system interrelationships are shown in figure 1-3.

UTAH WHITE RIVER DAM PROJECT

The Utah Board of Water Resources, acting through the Utah Division of Water Resources, is sponsoring construction of a dam on the White River about 6 miles southwest of Bonanza, Utah. The construction schedule for this dam has not been finalized, but construction would likely overlap with the Moon Lake power plant construction schedule. The reservoir has been identified by Deseret as an alternative water source. The potential impacts of this reservoir were analyzed by the BLM in the White River Dam Project Draft EIS published November 1980.

RANGELY RESERVOIR PROJECT

Water Users Association No. 1 of the Colorado River Water Conservation District (CRWCD) is proposing to build a reservoir on the White River near Rangely. A $13 million bond to build a reservoir at the Taylor Draw site was approved in August 1980.

An initial engineering feasibility study for the project has been prepared by Western Engineers of Grand Junction, Colorado. An environmental assessment has been prepared for Western Engineers by Fleming (1979). Applications for rights-of-way or permits have been filed with BLM and the U.S. Corps of Engineers. The impacts of this project will be analyzed in an independent NEPA document. A preliminary analysis is included in this Draft EIS. The lead agency for preparation of the study has not been designated. If approved, the construction of the reservoir would take place during the same time period as the Moon Lake project.

OIL SHALE DEVELOPMENT

Several potential oil shale developments on Federal lands in the Vernal-Rangely region could also affect the area. These include the White River Shale project in Utah and the Rio Blanco and Occidental projects in Colorado. The potential environmental impacts of oil shale leasing in the region were

7. Impacts on people if no additional energy is generated (impacts of no action).

8. Secondary benefits to communities from the generation and use of electricity.

9. Energy efficiency of the Rangely versus Bonanza site and co-generation potentials.

10. Comparison of costs of electricity to the consumer for the Rangely and Vernal project sites.

11. Cost of transporting water to the coal source (Rangely site) versus transporting coal to the water source (Bonanza site).

12. The future use of oil shale and tar sands as fuel for the power plant to offset costs of locating the power plant at Bonanza (away from the coal source).

13. Possible use of Deseret power transmission lines for transporting oil-shale-generated electricity.

14. The impact of the project on Utah State land.

15. The relationship of transmission lines to U.S. Forest Service land use and corridors.

16. Interactions of the project with the oil shale leasing program.

17. Cumulative impact of the oil shale development and Moon Lake project on air quality.

18. The impact of airborn emissions from the plant.

19. Degradation of air quality in Dinosaur National Monument and the general area.

20. The availability of adequate water supply from the White River in Colorado.

21. Effects of water withdrawal on salinity in the Colorado River and cumulative impacts with the CUP.

22. The effect of water withdrawal from the Green or White Rivers on threatened and endangered fish. These effects should be put in perspective with oil shale development, the White River Dam project, and the CUP.

23. Impact on private land from water withdrawal.

24. Effect on agriculture in the vicinity of the project.

25. Effects on game and non-game wildlife.

26. Effects on cultural resources.

27. Equal treatment of alternative sites in this Draft EIS.

Alternatives identified in the scoping process for inclusion in the Draft EIS are:

1. No action.

2. Railroad or coal slurry line versus conveyor.

3. The potential for use of other energy alternatives versus electrical generation (cumulative energy alternatives).

4. Alternate transmission line routing.

5. Transmission line right-of-way and tower sharing.

6. Market and service area exchange by utilities as an alternative to transmission line construction.

All of the issues and alternatives listed above were investigated and analyzed. These issues are addressed in the appropriate section of this Draft EIS, as well as those issues and alternatives required by law and regulation, and those identified during development of the document.

INTERRELATIONSHIPS WITH OTHER PROJECTS

TRANSMISSION SYSTEMS

Figure 1-2 shows the portions of the proposed Moon Lake transmission system that would parallel existing power transmission lines. The following describes those existing lines that would be paralleled by the segments designated in figure 1-2.

a. Deseret's proposed transmission corridor from the Bonanza or Rangely site to Mona would parallel:

   1. An existing MLEA 69-kV line in segments 9 and 10 (see the pocket map at the back of the book for location of segments).

   2. An existing Water and Power Resources Service 138-kV line in segment 26.

   3. Existing UP&L 138-kV and MLEA 138-kV lines in segments 9 and 10.

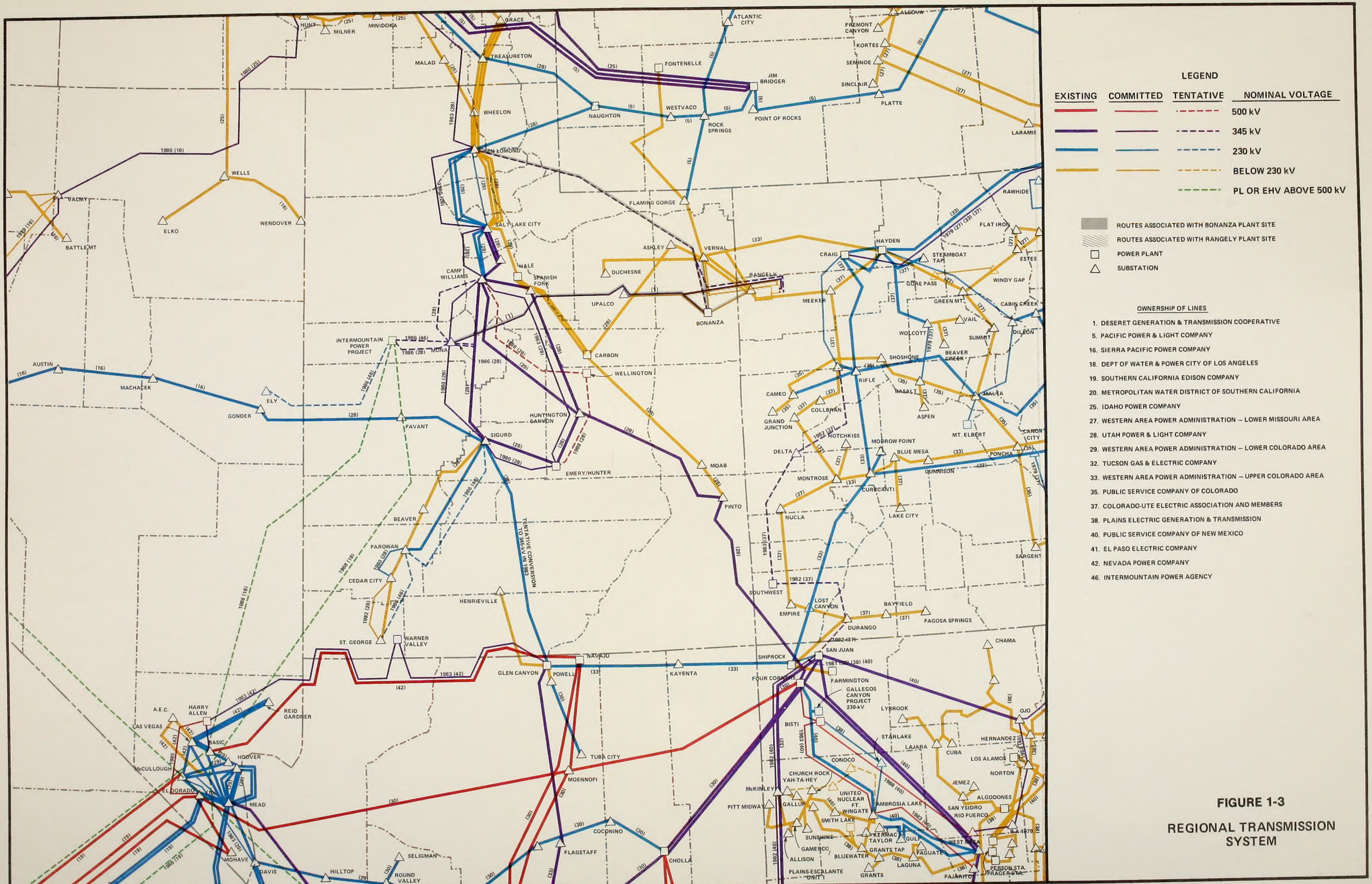


FIGURE 1-3

REGIONAL TRANSMISSION SYSTEM

analyzed in the Prototype Oil Shale Leasing Program Final EIS prepared by the USDI in 1973. In addition to oil shale projects on Federal lands, there are others (TOSCO, Geokinetics) on State and private lands. The cumulative population, air quality, and water use impacts of oil shale development and the Moon Lake project are analyzed in this Draft EIS, to the extent that oil shale plans are known.

Use of the oil shale trust fund is a discretionary action by individual state legislatures to mitigate socioeconomic impacts.

OIL AND GAS LEASING

Environmental analyses (EA) on oil and gas leasing in the Vernal-Rangely region have been prepared by the Vernal, Utah, and Craig, Colorado, Districts of the BLM. The EAs are general in nature but outline areas where Federal oil and gas leasing are allowed. The relationship of oil and gas leases to the Moon Lake project is analyzed in this Draft EIS.

REGIONAL COAL DEVELOPMENT

The environmental impacts of coal mining on existing Federal leases along with the projected production of non-Federal coal were analyzed in the Northwest Colorado Regional Coal Environmental Statement and Supplemental Reports prepared by BLM in 1977 and 1979, respectively. Another EIS, the Green River-Hamms Fork Regional Statement analyzes the potential impacts of mining coal on Federal areas that are under consideration for leasing in 1981.

The coal exploration areas involved with the Moon Lake project will be analyzed in a future regional coal EIS for possible leasing after 1981. This Draft EIS analyzes the site specific impacts of the Deserado Mine including the cumulative population impacts on the Rangely area.

ROCKY MOUNTAIN PIPELINE PROJECT

The Moon Lake project could also relate to the proposed Rocky Mountain Pipeline project which would carry natural gas from Wyoming to California. Construction of the pipeline is proposed for late 1984 and 1985. About 46 miles of the proposed route for the pipeline parallels proposed transmission line routes. An EIS on the Rocky Mountain Pipeline project is being prepared by BLM and the Federal Energy Regulatory Commission and will be completed in 1981.

CHAPTER 2
DESCRIPTION OF ALTERNATIVES

INTRODUCTION

The description of alternatives has been organized into major project component alternatives and general power project alternatives. Also included is the "No Action" alternative.

The major project component alternatives include power plant sites, raw material supply systems (i.e., coal supplies, coal transportation methods, water supplies and water transportation alternatives), and transmission system routing and configuration.

General power project alternatives include alternative methods of generating electrical power, alternate energy sources, different power plant designs, power purchase, and energy conservation measures.

Deseret has applied to the Bureau of Land Management (BLM) for (1) purchase of land for one of two plant sites, Bonanza or Rangely, with Bonanza as the proposed site; and (2) rights-of-way for raw material supply and transmission systems. The alternative plant sites are presented first and the remaining alternatives are discussed in relation to each plant site. Where facilities would be the same for both sites, the description is included in one alternative and referred to in the other.

Two scenarios on work force projections are presented. The first is the required work force for one unit with the Deserado Mine. The second is two units with the Deserado Mine assuming construction of unit 2 beginning 18 months after construction commences on unit 1. The latter scenario would be the maximum number of workers that would be employed at one time and the worst case analysis.

THE APPLICANT-PROPOSED ACTION

Deseret Generation and Transmission Cooperative (Deseret) has proposed to construct and operate a coal-fired generating station, consisting of two 400-megawatt (MW) units. Estimated power plant life is approximately 35 years. Figure 2-1 is a sketch of the proposed generating station and plant site facilities. About 10 percent (40 MW) of each unit's capacity would be used to power the station's electrical systems. Each unit would have a net power output of approximately 360 MW. The first unit is scheduled to go into commercial operation in December 1984; and, as presently planned, the second unit could go into operation between 1986 and the 1990s depending on future power demands.

Deseret's proposed location is the Bonanza site approximately 7 miles northwest of Bonanza, Utah in Uintah County.

Deseret's proposed course of action would be to pipe water approximately 19 miles from a collector-well system located beside the Green River (about 2.5 miles upstream from Walker Hollow) to the Bonanza site. This water would be taken from a 30-cubic-feet-per-second (cfs) water right already owned by Deseret.

Coal for the generating station would be supplied from a proposed underground coal mine, Deserado Mine, located 7 miles northeast of Rangely, Colorado. This mine would be operated for Deseret by Western Fuels Utah, Inc.,

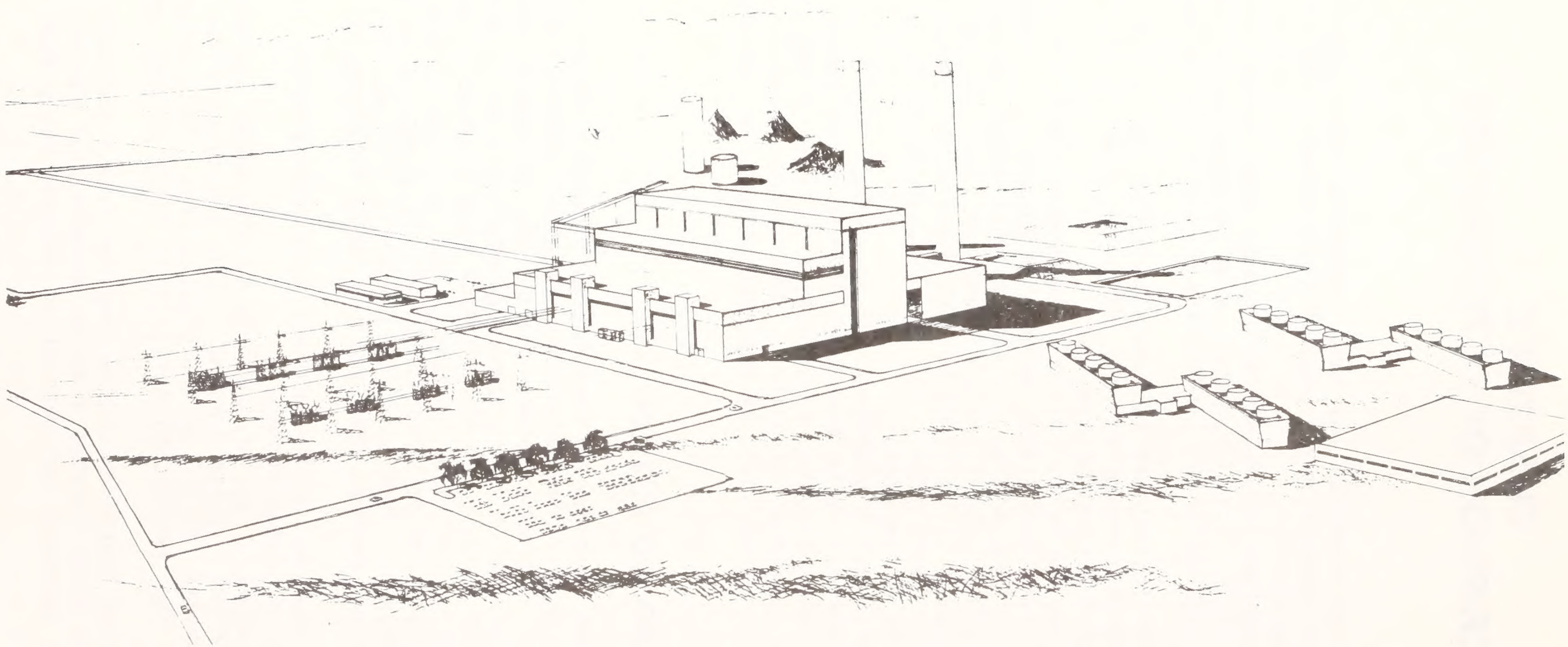


FIGURE 2-1

ARTIST'S SKETCH OF PROPOSED
GENERATING STATION

(Western Fuels) of Lakewood, Colorado. A 35-mile-long electric railroad is the proposed method for delivering coal to the Bonanza site.

The electricity generated by unit 1 of the proposed station would be distributed to Deseret's consumers by four transmission lines; one 345-kilovolt (kV) alternating current (a.c.) line and three 138-kV a.c. lines. The 345-kV line would extend from the generating station to a Utah Power and Light (UP&L) substation proposed for construction near Mona, Utah in Juab County. The 138-kV lines would extend from the generating station to existing substations near Upalco, Utah in Duchesne County; Vernal, Utah in Uintah County; and Rangely, Colorado in Rio Blanco County. The 138-kV line to the Upalco substation would be placed on the same towers as the 345-kV line to Mona. If unit 2 were constructed, a second 345-kV line would be built from the plant site to the UP&L Ben Lomond substation near Ogden, Utah or to the oil shale fields in Utah and Colorado. The actual destination would depend upon power demands at that time.

ALTERNATIVE PLANT SITES AND RAW MATERIAL SUPPLY SYSTEMS

The locations of the proposed and alternative power plant sites and raw material supply systems are shown in figures 2-2 and 2-3. The acreage requirements for all plant site and raw material supply alternatives are given in table 2-1. Deseret proposes to purchase the plant site from the BLM.

PLANT SITE ALTERNATIVES

The Moon Lake power plant project (Moon Lake project) began unofficially in 1958, when the Moon Lake Electric Association (MLEA) began field investigations of the general area around Rangely, Colorado to determine the economic feasibility of building a coal-fired steam-electric generating plant.

In August 1977, MLEA identified 12 potential sites in Uintah County, Utah (figure 2-4). The Utah Interagency Task Force on Power Plant Siting assisted MLEA with their attempt to select an acceptable power plant site in Utah and recommended that four sites receive additional study. The four Utah sites and the Colorado site were all considered viable.

The Bonanza site in Utah was selected as the applicant-proposed plant site because of recommendations by the Utah State Siting Committee and its proximity to the Green River which could be used as a water source. The Rangely site in Colorado was selected as an alternative site because of its proximity to the coal source at the Deserado Mine. Deseret has applied to BLM for rights-of-way for both sites.

APPLICANT-PROPOSED BONANZA PLANT SITE

<u>Bonanza Site Location and Access</u>

The Bonanza site covers about 1,840 acres of BLM-administered public and State lands. Figures 2-2 and 2-3 show the location of the plant site which is 23 miles southeast of Vernal, Utah.

The site is presently accessible by dirt roads from the north and south. A road extending southeast from U.S. Highway 40 at Vernal to Utah State Highway 45 at Bonanza, will be upgraded by Uintah County and the State of Utah in 1981. Three miles of additional paved road would be needed for the Moon Lake project and would require a 100-foot-wide right-of-way (36 acres) across BLM-administered public lands.

TABLE 2-1

Approximate Acreage Requirements for Power Plant and Raw Material Supply System Alternatives

Alternative Component	Bonanza Plant Site								Rangely Plant Site							
	System Length[a]	Disturbed			Occupied			ROW	System	Disturbed			Occupied			ROW
		BLM	State	Private	BLM	State	Private	Requested	Length	BLM	State	Private	BLM	State	Private	Request
Plant Site (ac.)	--	1,440	400	--	1,440	400	--	1,840	--	2,202	--	--	2,202	--	--	2,202
Plant Site Access	--	3	--	--	3	--	--	--	--	3.5[c]	1	--	3.5[c]	1	--	--
Roads (mi.)		(100'	ROW)[b]		(54')					(100')	(100')		(54')	(54')		
(ac.)	--	36	--	--	20	--	--	36	--	42[c]	12	--	23[c]	7	--	54[a]
<u>Deserado Mine Complex</u>																
Portal Area (ac.)	--	100	--	--	100	--	--	100	--	100	--	--	100	--	--	100
Refuse Disposal Area (ac.)	--	609	--	--	609	--	--	1,944	--	609	--	--	609	--	--	1,944
Refuse Haul Road (mi.)	6	6	--	--	6	--	--	2	--	6	--	--	6	--	--	2
		(100')			(54')			(100')		(100')			(54')			(100'
(ac.)	--	73	--	--	39	--	--	24	--	73	--	--	39	--	--	24
138-kV transmission	5	5	--	--	5	--	--	5	--	5	--	--	5	--	--	--
line (mi)		(165')			(21')					(165')			(21')			
(ac.)	--	100	--	--	13	--	--	100	--	100	--	--	13	--	--	100
12.5-kV transmission	3.7	3.7	--	--	--	--	--	3.7	3.7	3.7	--	--	--	--	--	3.
line (mi.)								(20')		(20')						(20'
(ac.)	--	9	--	--	--	--	--	9	--	9	--	--	--	--	--	9
Alluvial Wells (ea.)	--	5	--	--	5	--	--	--	--	5	--	--	5	--	--	--
or intake structures																
(ac.)	--	1	--	--	1	--	--	1	--	1	--	--	1	--	--	1
Water Supply	3.4	3.4	--	--	3.4	--	--	3.4	--	3.4	--	--	3.4	--	--	3.
Pipeline (mi.)		(30')			(30')			(30')		(30')			(30')			(30'
(ac.)		12			12			12		12			12			12
Ventilation Entry	--	18	--	--	18	--	--	18	--	18	--	--	18	--	--	18
<u>Coal Transportation Alternatives</u>																
Electric Railroad																
Railroad Mainline	35	27	2	6	27	2	6	35	--	--	--	--	--	--	--	--
(mi.)		(140')	(140')	(140')	(40')	(40')	(40')	(140')								
(with substation)	--	461	34	102	134	10	29	485	--	--	--	--	--	--	--	--
(ac.)																
Coal Storage and Loadout Area	--	256	--	--	105	--	--	256	--	--	--	--	--	--	--	--
Coal Delivery	3.5	2.8	--	--	2.8	--	--	3.5	--	--	--	--	--	--	--	--
Conveyor (mi.)		(150')			(150')			(150')								
(ac.)		51			8			64								
Overland Conveyor	31	27	--	2	27	--	2	29	4	2	--	--	2	--	--	2
(mi.)		(100')		(100')	(25')		(25')	(250')		(100')			(25')			(250'
(with access road)	--	352	--	24	88	--	6	879	--	24	--	--	6	--	--	61
(ac.)																
Slurry Pipeline (mi.)	33	30	--	1	--	--	--	31	--	--	--	--	--	--	--	--
		(50')		(50')				(50')								
(ac.)	--	182	--	6	--	--	--	194	--	--	--	--	--	--	--	--
Truck Haul Roads	40	5	--	--	5	--	--	5	5	2	--	--	2	--	--	2
On-Highway (mi.)		(100')			(32')			(100')		(100')			(32')			(100'
(ac.)	--	206	--	--	66	--	--	206	--	24	--	--	8	--	--	24
Off-Highway (mi.)	38	32	1	4	32	1	4	37	5	1	1	--	1	1	--	2
		(120')	(120')	(120')	(55')	(55')	(55')	(120')		(100')	(100')		(54')	(54')		
(ac.)	--	466	15	58	214	7	26	538	--	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]	--[d]

(continued)

TABLE 2-1 (concluded)

Alternative Component	Bonanza Plant Site: System Length[a]	Disturbed: BLM	Disturbed: State	Disturbed: Private	Occupied: BLM	Occupied: State	Occupied: Private	ROW Requested	Rangely Plant Site: System Length	Disturbed: BLM	Disturbed: State	Disturbed: Private	Occupied: BLM	Occupied: State	Occupied: Private	ROW Requeste
Water Source Alternatives																
Collection Well System for Green River	--	12	--	4	2	--	1	2	--	12	--	4	2	--	1	2
Bonanza Green River Pipeline (mi.)	19	14 (70')	1 (70')	1 (70')	14	1	1	16 (70')	--	--	--	--	--	--	--	--
(ac.)	--	119	9	9	--	--	--	135	--	--	--	--	--	--	--	--
Rangely Green River Pipeline (mi.)	--	--	--	--	--	--	--	--	42.7	26.6 (70')	2 (70')	13 (70')	26.6	2	13	41. (70'
(ac.)	--	--	--	--	--	--	--	--	--	226	17	110 ,	--	--	--	353
Utah White River Res. Pipeline (mi.)	11	7 (70')	2 (70')	0.5 (70')	7	2	0.5	9.5 (70')	--	--	--	--	--	--	--	--
(ac.)	--	60	17	4	--	--	--	81	--	--	--	--	--	--	--	--
Taylor Draw Reservoir	--	--	--	--	--	--	--	--	--	--	--	--	110.5	8.5	450.0	569[e]
Taylor Draw Reservoir Pipeline	--	--	--	--	--	--	--	--	5[f]	--	--	--	--	--	--	5
Wolf Creek Reservoir	--	--	--	--	--	--	--	--	--	--	--	--	581	--	1,227	581[e]
Wolf Creek Reservoir Pipeline (mi.)	--	--	--	--	--	--	--	--	8.4	4.7 (70')	--	3.5	4.7	--	3.5	8. (70'
(ac.)	--	--	--	--	--	--	--	--	--	40	--	--	--	--	--	70

[a]System lengths are approximate. Right-of-way (ROW) requirements are estimated only to the plant site boundaries.

[b]All numbers in parentheses represent right-of-way widths and are expressed in feet.

[c]The plant site access road shares a common corridor with the refuse haul road for 2.5 miles. The figures presented here do not include that common corridor.

[d]All of the off-highway coal haul road ROW for the Rangely site is included in the Rangely site access road and refuse haul road ROW. No additional acreage is presented here.

[e]ROW would be required by Colorado River Water Conservation District, Water User's Association No. 1; not by Deseret.

[f]This road would be within the Staley-Gordon Mine road ROW and coal conveyor utility corridor. For that reason, no further disturbed or occupied acreage or ROW width is shown on the table.

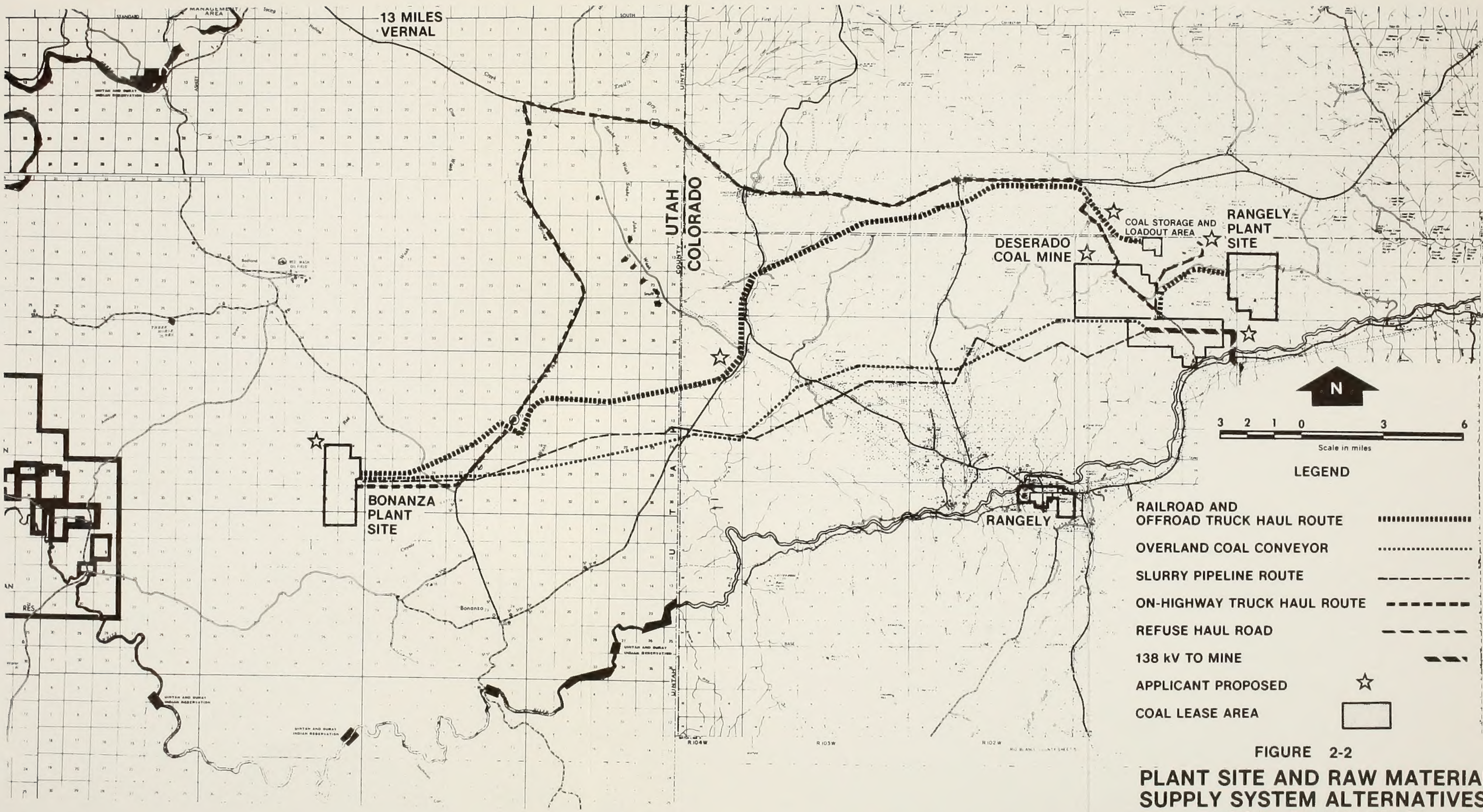


FIGURE 2-2

PLANT SITE AND RAW MATERIAL SUPPLY SYSTEM ALTERNATIVES (COAL TRANSPORT)

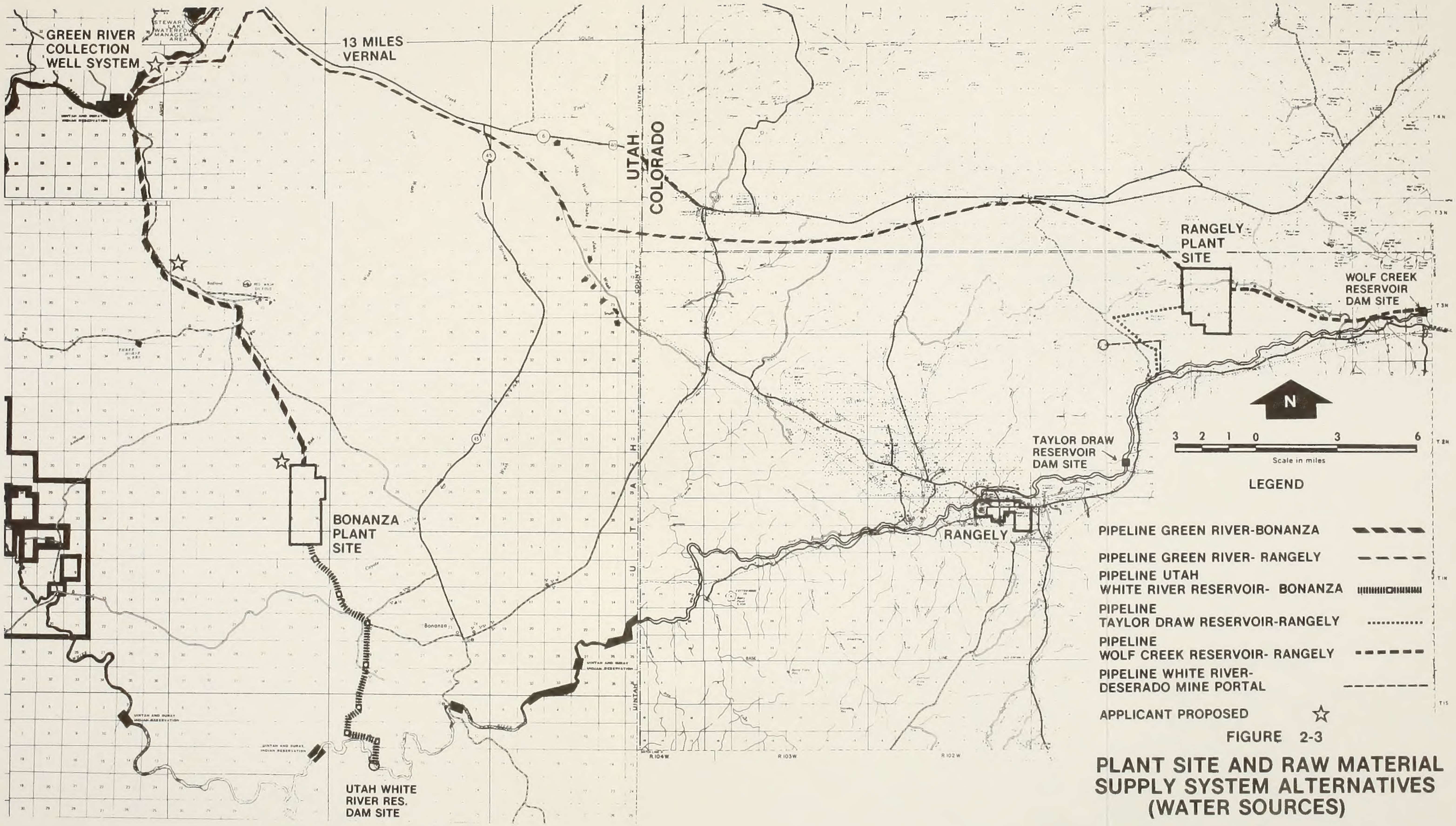


FIGURE 2-3

PLANT SITE AND RAW MATERIAL SUPPLY SYSTEM ALTERNATIVES (WATER SOURCES)

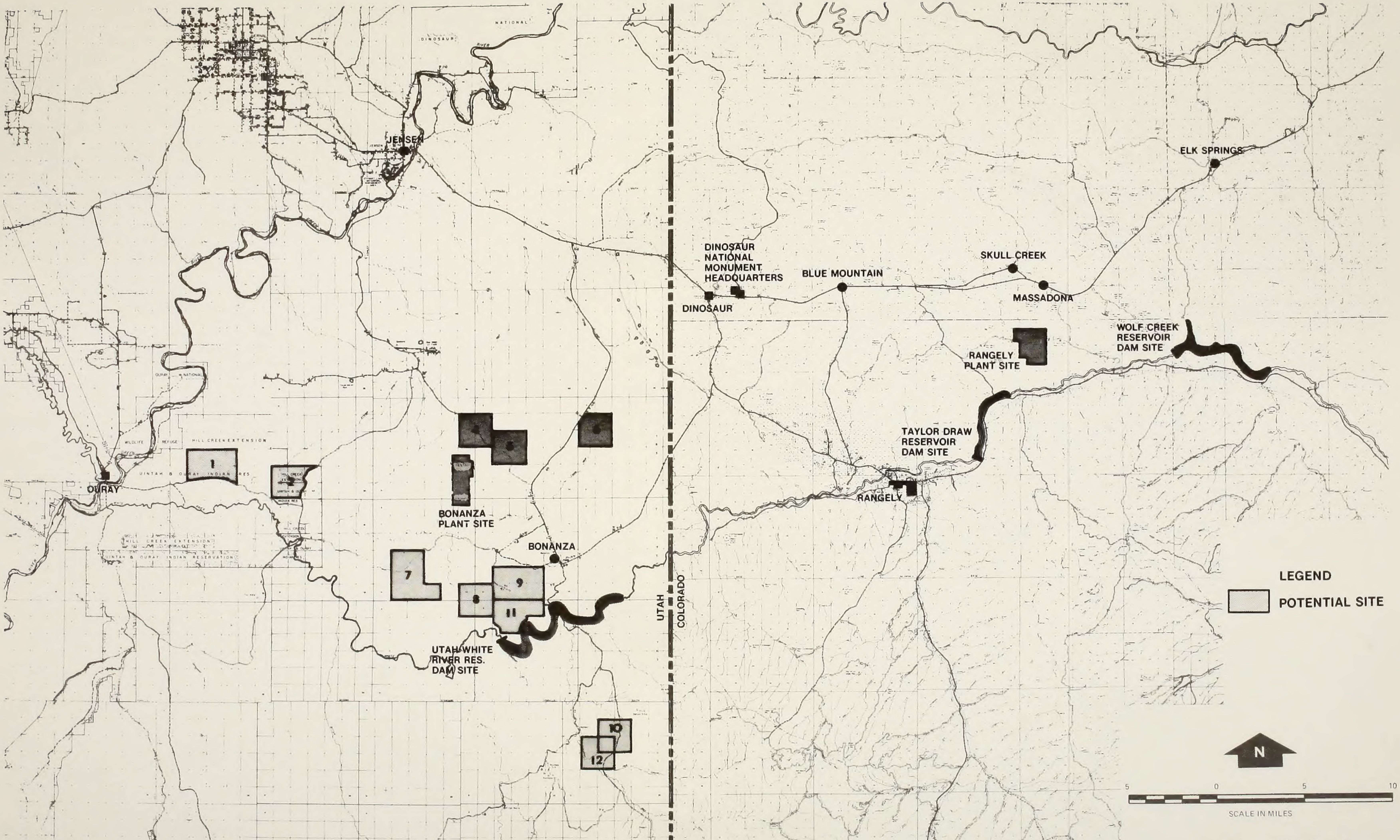


FIGURE 2-4

UTAH-COLORADO SITE LOCATION MAP

Deseret proposes to use U.S. Highways 6 and 50, 40, and Colorado Highways 64 and 139, Utah Highway 45, and portions of Uintah County roads (see figure 2-5) to transport about 17 truckloads of heavy equipment ranging in weight from 50 to 303 tons and up to 70 feet long and 15 feet wide. This equipment would be delivered to the plant site from a railhead at Mack, Colorado.

Multi-axled transport trailers would be used so that weight per tire would be similar to or less than weight per tire associated with standard 5-axled semi-truck trailers. The average speed of the moving equipment would be 3 to 5 miles per hour. No road improvements would be required but, of 16 bridges along the route, 5 would be shored or upgraded before crossing, and 11 would be crossed by jumper bridges. Shoring would involve the application of steel girders or other support structures. A 210-foot-long bridge across the White River near Rangely, Colorado would be shored by installing concrete footings and pilings while diverting water from one-half of the river at a time.

Jumper bridges would be carried by truck and placed over bridges that are 50 feet or less in length. Jumper bridges carry the entire weight of the load and can be positioned and removed within a few minutes.

Bonanza Site Facilities and Layout

Facilities and layout of the plant site are shown in figure 2-6. The coal storage areas would hold about 667,000 tons of coal and allow both units to operate at 80-percent capacity for 90 days without coal delivery.

Each of the two 400-MW turbine-generators would be driven by steam produced by coal-fired boilers. Each boiler, at maximum capacity, would burn 193 tons of pulverized coal per hour. The boiler unit would be designed to burn coal with the characteristics shown in table 2-2.

Number 2 fuel oil or coal may be used for boiler start-up and to stabilize low-load flame in the boiler's burners. If fuel oil were used, it would be stored in two 750,000-gallon tanks. Both tanks would be surrounded by a dike to contain potential spills. Between 500 and 600 thousand gallons of fuel oil would be required for start-up of unit 1. Total maximum consumption of fuel oil over the life of the project is estimated at about 24 million gallons. Between 70 and 75 10,000-gallon truckloads of fuel oil per year would be required.

The design of the fuel oil unloading pump station would include provisions for containing any leaks or spills. All areas within the plant site that may be subject to oil leaks or spills would incorporate control measures that are in compliance with the requirements for Spill Prevention Control and Countermeasure Plans as contained in 40 CFR 112.3.

Four mechanical draft wet cooling towers would extract heat from the plant water circulation system. Each generating unit would be served by two cooling towers. The maximum water loss for two units would be 14,780 gallons per minute (gal/min).

Bonanza Site Emission Control

Centralized control and monitoring systems would be provided to optimize operation and provide monitoring data on plant emissions.

A fabric-filter baghouse would control particulate matter. The baghouse would remove approximately 99.6 percent of the fly ash.

The sulfur dioxide (SO_2) removal system would consist of a wet limestone scrubber capable of removing 90 percent or greater of the SO_2 produced in the

TABLE 2-2

Design Coal Characteristics

	Range		
Heating Values, Btu/lb	10,000.0	-	11,500.0 (avg. 10,500)
Moisture, Percent	4.0	-	15.0
Carbon, Percent	55.0	-	68.0
Hydrogen, Percent	4.0	-	5.0
Nitrogen, Percent	0.8	-	1.3
Sulfur, Percent	0.4	-	1.0 (avg. 0.45 ± 0.26)
Chlorine, Percent	0.01	-	0.12
Oxygen, Percent	11.0	-	15.0
Ash, Percent	7.0	-	13.0
Percent Composition of Ash			
Phosphorous Pentoxide, P_2O_5	0.6	-	1.2
Silicon Oxide, SiO_2	45.0	-	65.0
Ferric Oxide, Fe_2O_3	1.0	-	3.5
Aluminum Oxide Al_2O_3	20.0	-	35.0
Titanium Oxide, TiO_2	0.5	-	2.0
Calcium Oxide, CaO	1.0	-	6.0
Magnesium Oxide, MgO	0.5	-	2.0
Potassium Oxide, K_2O	0.4	-	1.0
Sodium Oxide, Na_2O	1.0	-	3.0
Sulfur Trioxide, SO_3	0.5	-	5.0
Undetermined	0.5	-	3.0

Source: Burns and McDonnell, 1980.

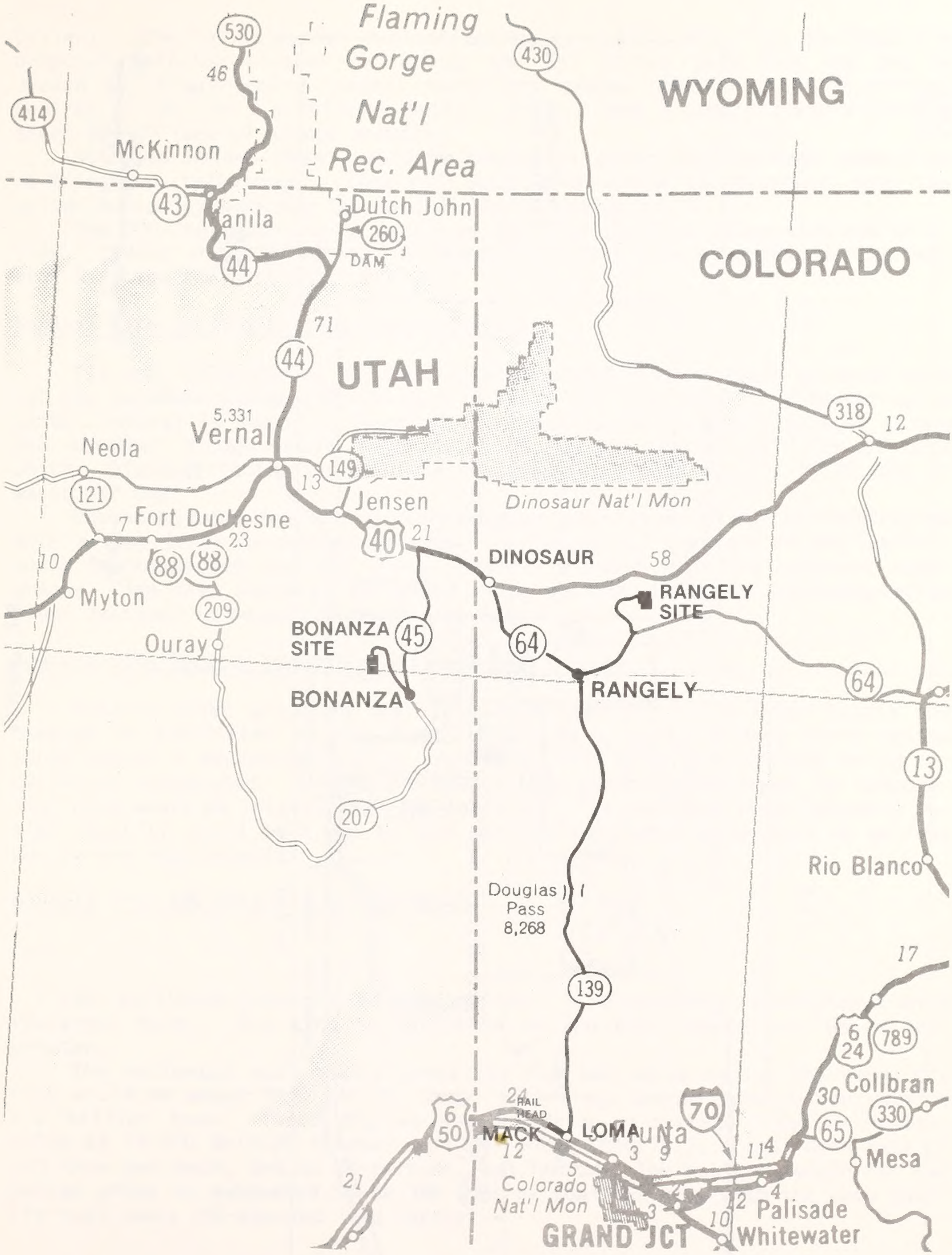


FIGURE 2-5

BONANZA AND RANGELY SITES HEAVY HAUL ROUTES

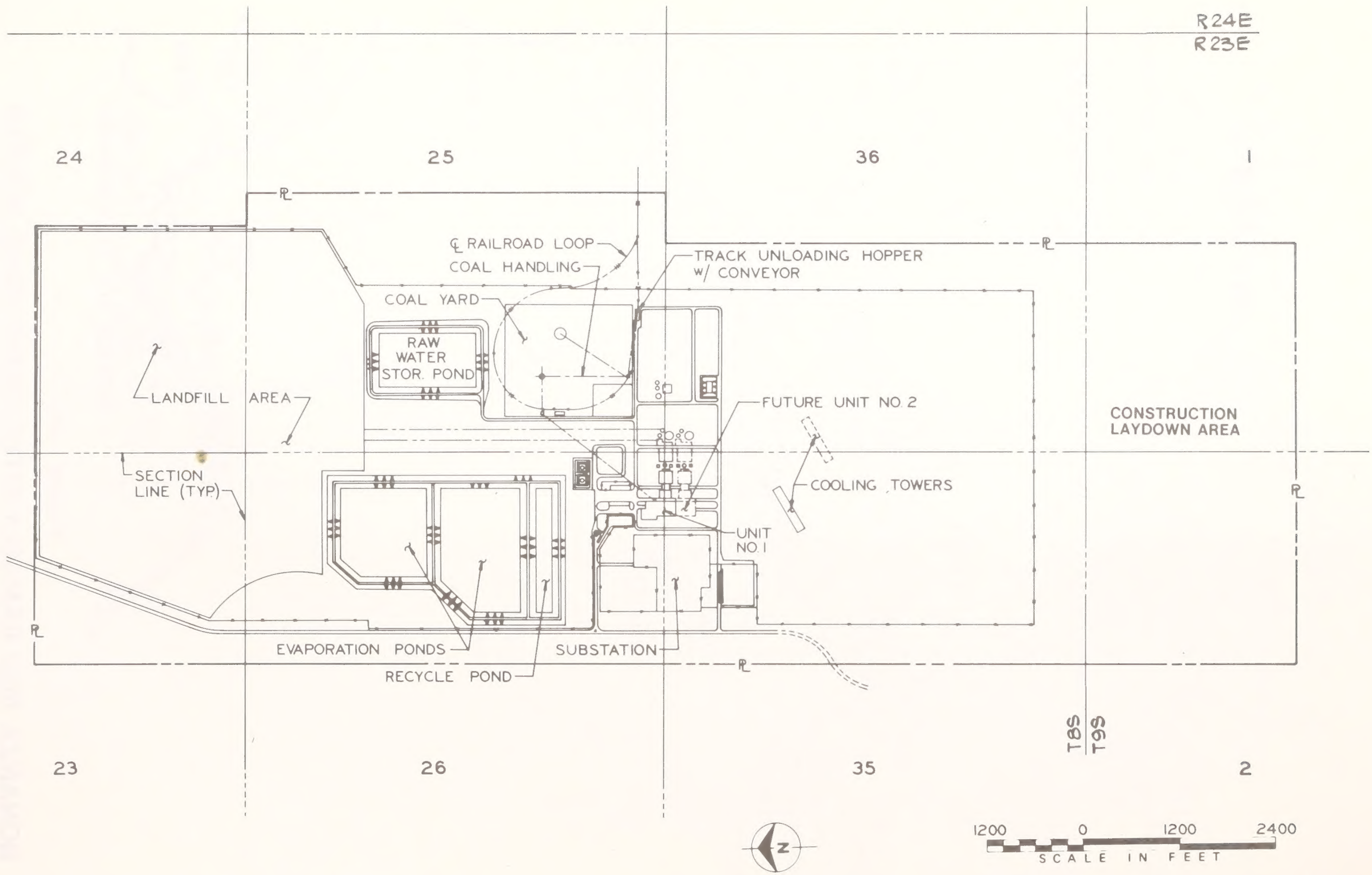


FIGURE 2-6

BONANZA PLANT SITE LAYOUT

boilers. The Environmental Protection Agency ([EPA] 1980) has reviewed the proposed emission control technology and has stated that they can see no reason why the proposed control technology cannot achieve up to 95 percent control of SO_2 on a continuous basis. Units 1 and 2 combined would produce about 82,400 tons of sludge annually.

Nitrogen oxides (NOx) would be partially controlled through combustion modification techniques. Specific techniques would be designed into the boiler burner systems for the specific boiler selected.

Two 600-foot-high stacks would be used for emission dispersion and dilution. Stacks would be lighted to meet aircraft safety standards of the Federal Aviation Administration (FAA).

Bonanza Site Ash and Scrubber Waste Disposal

Fly ash, collected by the particulate removal system, would be mixed with wet SO_2 scrubber sludge and placed in a landfill. The landfill site for solid waste disposal is shown in figure 2-6. A maximum of 11.3 million tons of ash and scrubber sludge would be produced during the operational life of both units. Disposal facilities would be designed for a peak rate of 1,100 tons of waste per day.

Depending upon regulatory determination, the landfill may be constructed with a clay liner to prevent seepage. Periodically, portions of the landfill would be compacted and the final contours blended with the adjacent topography. The area would be reclaimed using methods described in revegetation plans designed in cooperation with the BLM.

Bonanza Site Potable Water and Sanitary Waste Syste

Potable water would be extracted from the main plant water source and treated in facilities on the plant site. An on-site sanitary waste system would employ a mechanical sewage treatment plant with the effluent being recycled or evaporated. Should the evaporative method be employed, an evaporation pond would be located near the landfill. The sanitary waste system's design capacity would be 8,000 gallons per day (gal/day) assuming a 40 gal/day per person requirement.

Bonanza Site Raw Material Needs

Coal

The applicant-proposed source of coal is a proposed underground mine (Deserado Mine). The mine is discussed in the Coal Supply section of this chapter.

The estimated coal requirements for the two units during the project's life would be about 94.5 million tons, an average annual consumption rate of 2.7 million tons. These figures are based on an average lifetime heating value of 10,500 British thermal unit per pound (Btu/lb.), a coal burn rate of 193 tons per hour, and an 80-percent load factor. The maximum demand for two boiler units is estimated to be 386 tons of coal per hour with the same quality coal and a 100-percent load factor.

Water

Up to 17,470 acre-feet per year (11,000 gal/min) would be withdrawn from the Green River for use at the generating station. Figure 2-7 is a diagram of the water budget.

The applicant-proposed source of water for the Bonanza site is a 30 cfs (21,720 acre-feet per year) water right on the Green River. Alternative water sources and pipeline routes are discussed in following sections under those headings. A water storage reservoir with a capacity of 475 acre-feet would be located on the plant site.

Construction water for the first unit at the Bonanza site would be taken over a 4-year period from the Green River.

Limestone

About 1.93 million tons of high quality limestone (92 to 97 percent $CaCO_3$) would be used over the 35-year life of the Moon Lake project for removing SO_2 from the flue gases. Limestone would be obtained from one of four possible sources: LeGrand Johnson near Logan, Utah; Kiegley Quarry near Payson, Utah; Marblehead Lime near Wendover, Utah; or Continental Lime near Black Rock, Utah. Assuming 23 tons per truck, this would require about 46 truckloads per week on the highways between the supplier and the plant site.

Borrow Materials

Borrow material (sand, gravel, and fill dirt) needs are projected to be about 728,800 cubic yards which would be taken from ten separate sites with a total area of about 143 acres. Three of the borrow areas are within or adjacent to the Bonanza site boundaries and seven are along the Bonanza to Green River water supply pipeline route (figure 2-8). The seven areas outside the plant site boundaries total 127.2 acres.

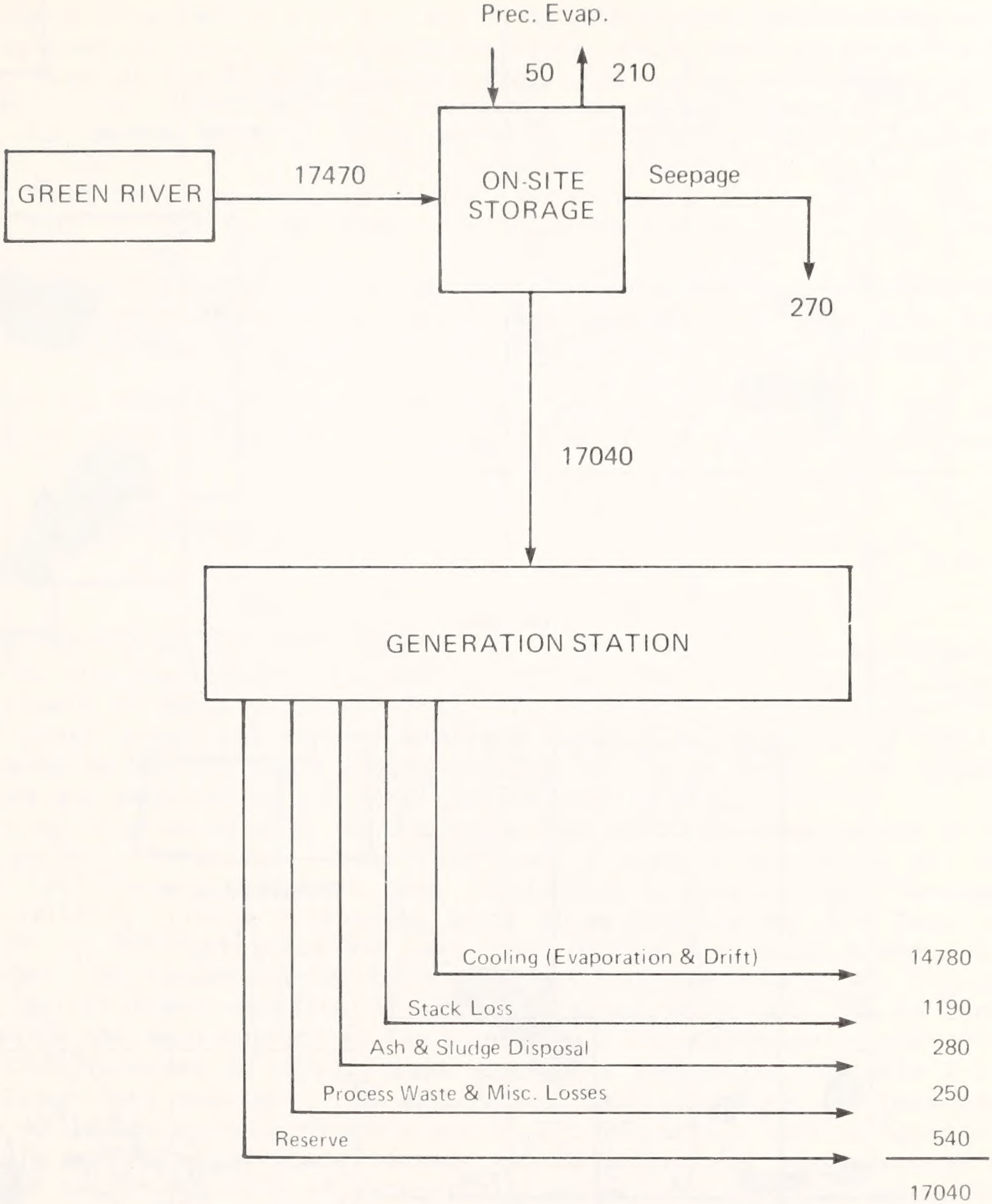
RANGELY ALTERNATIVE SITE

Rangely Site Location and Access

Figures 2-2 and 2-3 show the proposed location of the Rangely site, 10 miles northeast of Rangely. The site would occupy 2,202 acres of public lands administered by BLM.

The Rangely site is located between U.S. Highway 40 and Colorado State Highway 64. Both highways are less than 5 miles from the site, and graveled roads lead to the site from both highways. An existing bridge on the Staley-Gordon Mine road would be upgraded. A 1-mile section of the Staley-Gordon Mine road immediately north of the White River would be relocated about 0.25 mile to the east. Access road locations are shown in figures 2-2 and 2-3.

Heavy equipment would be delivered to the plant site from a railhead at Mack, Colorado via U.S. Highway 6 and 50, Colorado Highways 64 and 139 and the Staley Gordon Mine road (see figure 2-5). No road improvements would be required but of 14 bridges along the route, 3 would be shored or upgraded before crossing and 11 would be crossed by jumper bridges.



Notes:

1. Water quantities shown are preliminary estimates. Actual quantities are subject to final engineering design.
2. Operating conditions of wet-tower evaporative cooling system. Evaporative cooling - 90% recirculation - 400,000 GPM ΔT-22°
3. Cooling tower flow based on 15 cycles of concentration.
4. Indicated flows represent maximum use in acre-feet per year assuming a 100% capacity factor.
5. Drift loss estimated to be 0.008% of circulation flow.
6. Evaporation and precipitation estimated at 3.0 and 0.67 feet per year, respectively.

FIGURE 2-7

PLANT WATER USAGE TWO UNITS MAXIUM LOADING

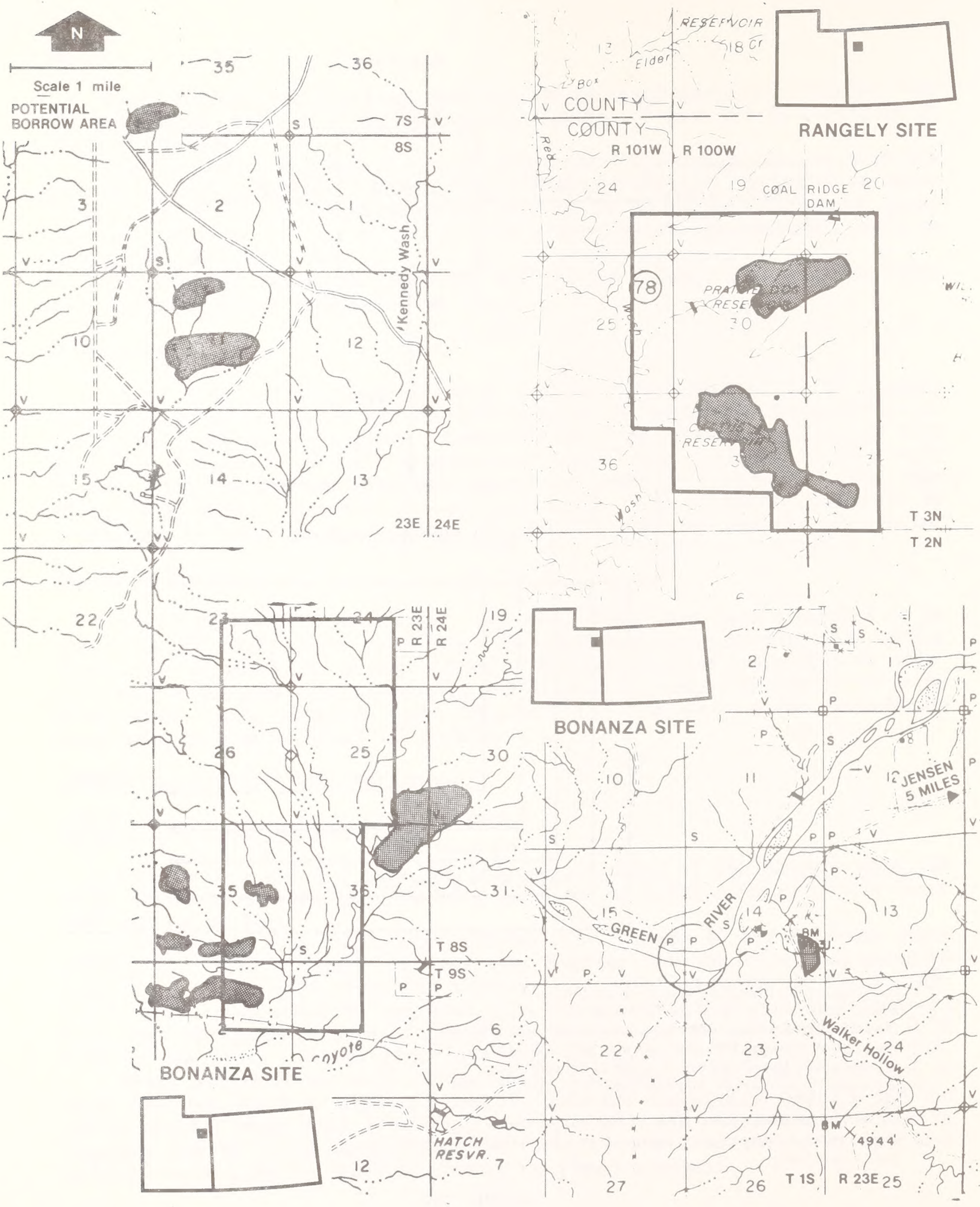


FIGURE 2-8

PLANT SITE BORROW MATERIAL AREAS

Rangely Site Facilities, Layout, and Raw Material Needs

The Rangely alternative site's, facilities, structures, capacities, raw material requirements, design coal characteristics, etc., would be essentially the same as those of the proposed Bonanza site. The layout would be as shown in figure 2-9. The limestone source would also be as described for the Bonanza site, but borrow material needs would be different. Borrow material (sand, gravel, and fill dirt) needs are projected to be up to 2,230,000 cubic yards which would be taken from two separate sites with a total area of about 370 acres. Both of the borrow areas are contained within the Rangely site boundaries (figure 2-8).

The applicant-preferred system for coal transport to the Rangely site from the Deserado Mine would be a 4-mile-long conveyor. This conveyor and other alternatives are described in the Coal Transportation Alternatives section.

Water for the Rangely site would be piped from the Green River in Utah or the White River in Colorado as discussed in the Water Supply Alternatives section.

COAL SUPPLY ALTERNATIVES

INTRODUCTION

The applicant-proposed coal supply for either the Bonanza or Rangely sites would be the development of a new underground coal mine (Deserado Mine) 7 miles northeast of Rangely (figure 2-2). The mine would include two existing Federal lease areas and three preference right lease application (PRLA) areas, all owned by Western Fuels (location shown in figure 2-10). The leases and PRLA areas are proposed as a Federal Logical Mining Unit.

All mining associated with the Deserado Mine would be done in the Williams Fork geologic formation. Nine coal seams traceable throughout all or part of the coal lease areas have been identified by Western Fuels through exploration drilling. These nine seams occur in a coal-bearing zone that is generally 200- to 300-feet thick and have been labeled A through H and J in ascending order. Of these, only B, B/C, and D are considered minable. Figure 2-11 shows typical cross sections of the coal seams which are 100 to over 1,000 feet below the land surface in the mine area. The estimated recoverable and washed coal reserves of the minable seams are summarized in table 2-3.

The clean coal reserves from the various coal seams in the Deserado Mine area as estimated by Western Fuels are 55,299,000 tons. This is about 44 percent of the estimated in-place tonnage and 80 percent of the recoverable reserves. The 55,299,000 tons of recoverable washed coal represent about 59 percent of the two-unit coal requirement or a 20-year supply for the two-unit power plant (assuming an 18-month delay between completion of units 1 and 2).

After the 20-year period (year 2006 assuming 1986 completion date of unit 2), additional leasing or open market buying would be required. Additional coal is available in Federal coal exploration areas contiguous to the northern boundary of the Western Fuels coal lease and PRLA areas. Western Fuels estimates that there is sufficient additional coal for the life of the project. Under the current Federal coal management regulations, Deseret would be required to participate in competitive leasing for the exploration lands and may or may not be able to secure additional coal for expansion of the Deserado Mine.

TABLE 2-3

Estimated Coal Reserves (tons) in the Deserado Mine Lease and Preference Right Lease Application Areas

Reserves	Seam	In-Place	Recoverable	Washed
By Area				
Federal Coal Lease	D	29,550,000	14,182,000 (48%)	12,055,000 (85%)
C-023703	B-B/C	24,690,000	9,940,000 (40%)	7,455,000 (75%)
Federal Coal Lease	D	6,360,000	3,070,000 (48%)	2,601,000 (85%)
D-047201	B/C	5,750,000	3,730,000 (65%)	2,984,000 (80%)
Federal PRLA Areas	D	8,410,000	4,205,000 (50%)	3,364,000 (80%)
C-8424 and C-8425	B	43,895,000	30,727,000 (70%)	24,582,000 (80%)
Federal PRLA Area	D	3,730,000	1,585,000 (42%)	1,189,000 (75%)
C-0126669	B/C	3,730,000	1,425,000 (38%)	1,069,000 (75%)
Total		126,115,000	68,864,000 (55%)	55,299,000 (80%)
By Coal Seams				
	D	48,050,000	23,042,000 (48%)	19,209,000 (83%)
	B-B/C	78,065,000	45,822,000 (59%)	36,090,000 (79%)
	Total	126,115,000	68,864,000 (55%)	55,299,000 (80%)

Source: Western Fuels, 1980.

Assumptions

The following criteria were used to calculate in-place coal reserves:

1. coal thickness must be greater than 3.5 feet.
2. overburden depth must be greater than 100 feet.

Maps and reserve data thus generated indicate that substantial reserves exist only in seams D, B, and B/C and, for the purpose of this report, only these reserves are considered. Using a coal density of 1.35 grams per cubic centimeter, the in-place reserves were estimated at 126,115,000 tons in the minable seams.

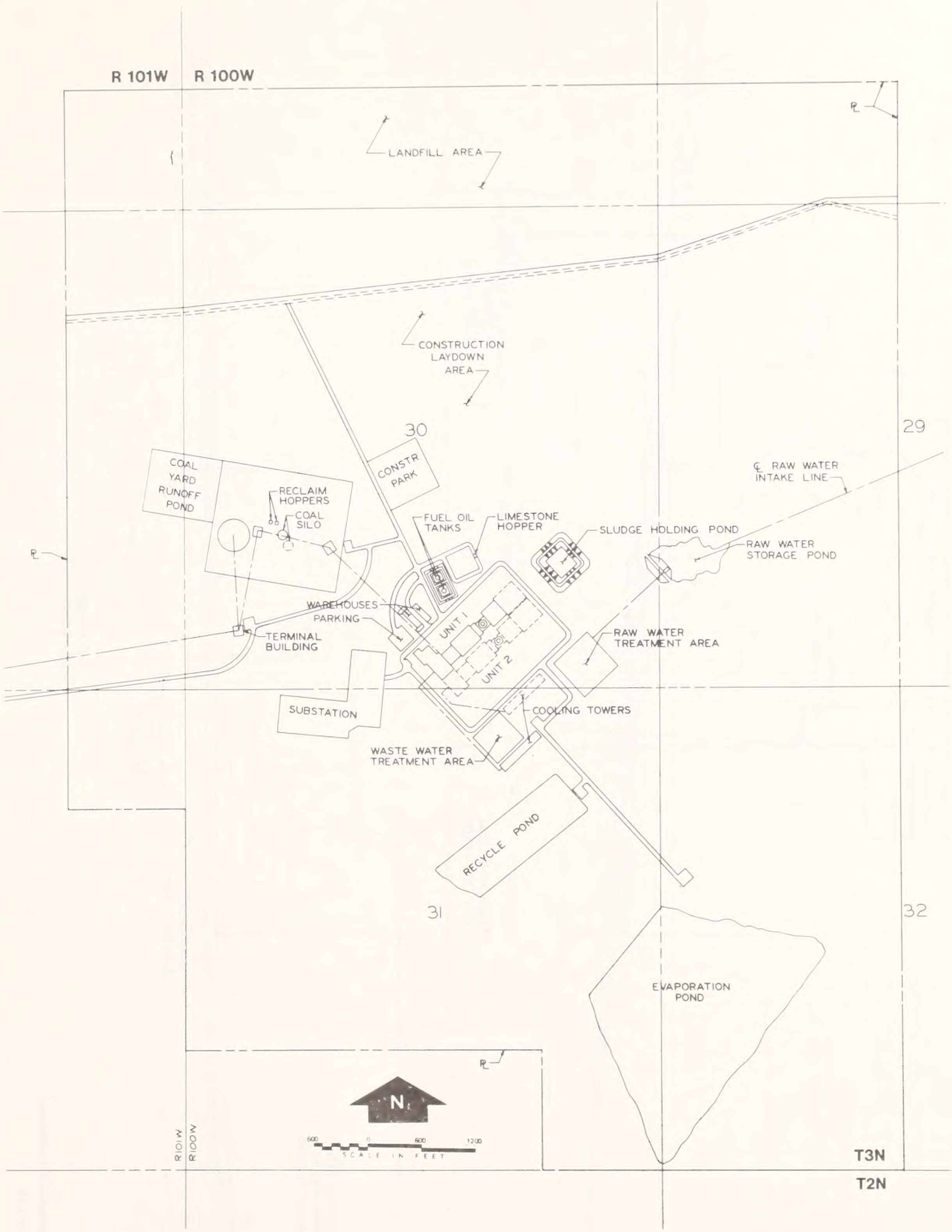


FIGURE 2-9

RANGELY PLANT SITE LAYOUT

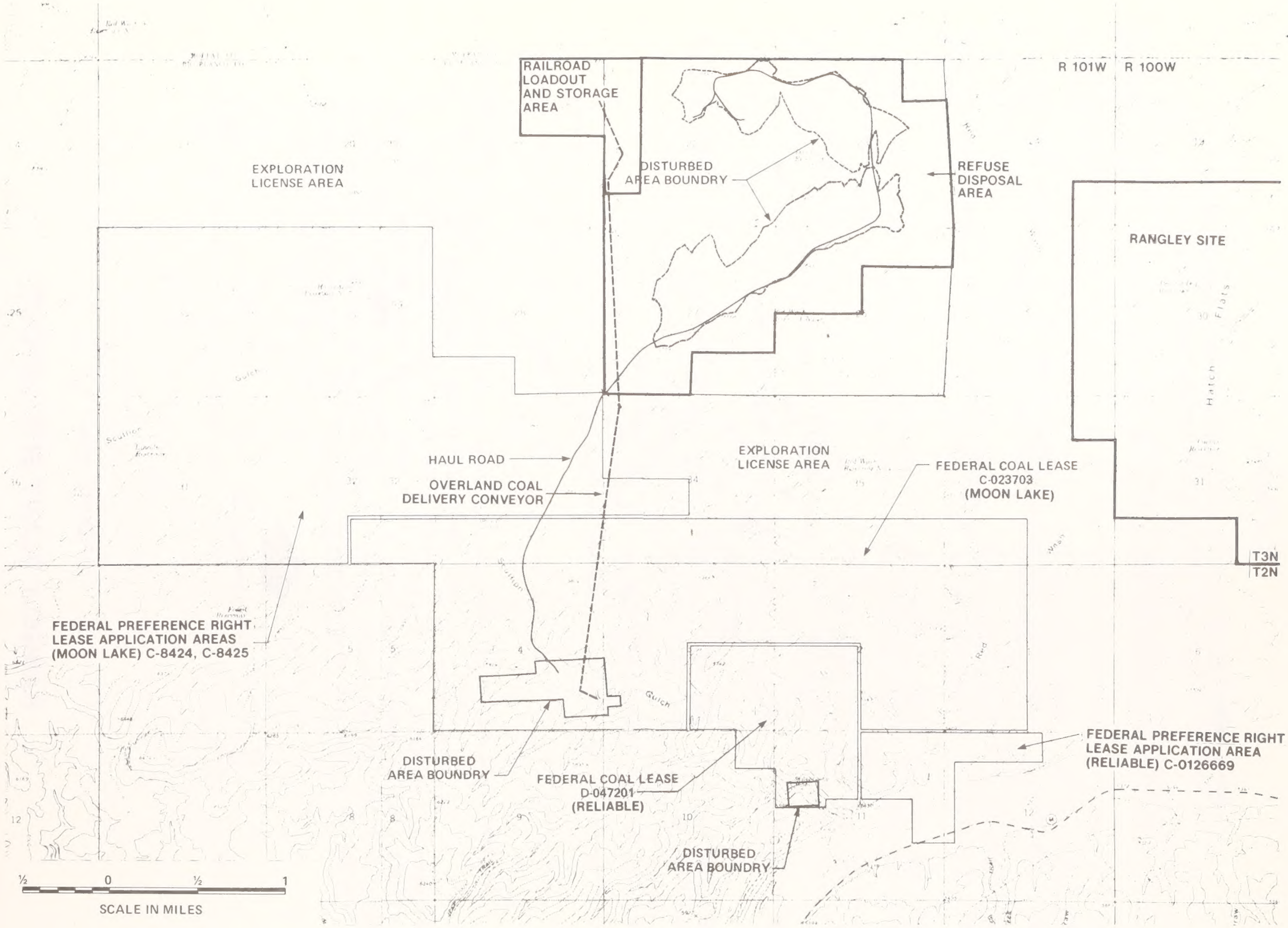
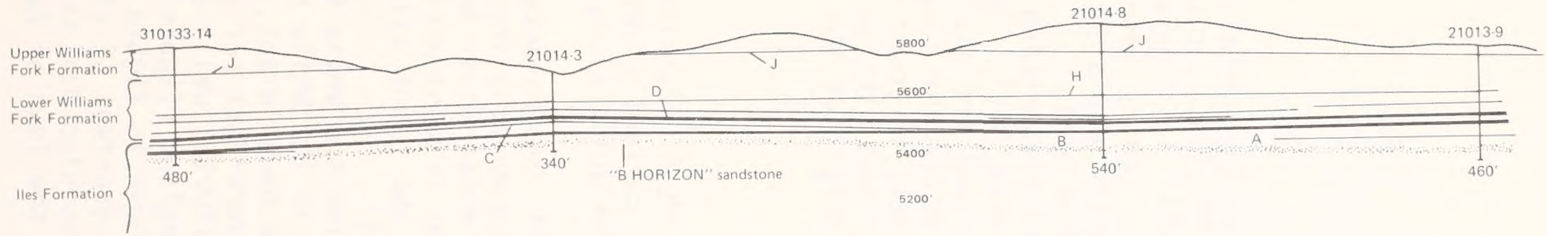
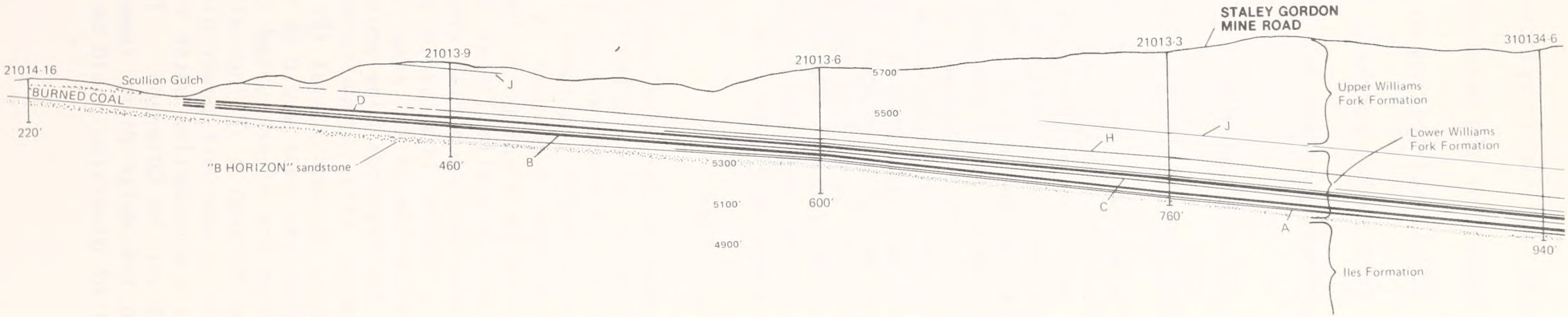


FIGURE 2-10

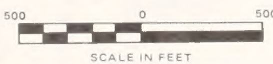
DESERADO MINE LOGICAL MINING UNIT



A Typical Cross Section Along the Strike



A Typical Cross Section Along the Dip



Source: Western Fuels Association

FIGURE 2-11

TYPICAL CROSS SECTIONS OF THE COAL SEAMS

The possible coal supply options are presented below:

1. Development of the Deserado Mine supplemented by:

   a. Additional leasing on contiguous coal exploration areas or

   b. Open market purchase for 15 years.

2. Open market purchase for 35 years.

DEVELOPMENT OF THE DESERADO MINE

Deserado Mine Surface Facilities

The major areas with surface facilities would be the portal, ventilation entry, and refuse disposal areas. The portal facilities, including a coal washing plant and surface conveyors, are illustrated in figure 2-12. The 100-acre portal area would have a "D" portal entry (entry into the D coal seam) and a "B" portal entry. The ventilation entry would be off of the portal area (figure 2-13) at the old Staley-Gordon Mine portal.

The landfill refuse disposal areas for the coal preparation plant would be located north of the portal area as shown in figure 2-13. The coal beds under the refuse disposal area dip about 70 degrees and are not minable. An evaporation pond would be placed in each drainage below the landfill areas. The water quality in each pond would be monitored and, if found to be toxic, the ponds would be fenced. These ponds would be lined with an impermeable liner depending upon regulatory determination. A detail of the refuse disposal areas is shown in figure 2-14.

Deserado Mine Utilities

Electric power to the mine would be provided by MLEA. Construction power would be supplied by an existing 12.5-kV line that currently serves the old Staley-Gordon Mine. A temporary 12.5-kV line would be built along the Staley-Gordon Mine road to reach the portal area.

If the mine were developed in conjunction with the Bonanza site, permanent power would be supplied to the mine by tapping an existing 138-kV line and constructing a 3.4 mile 138-kV line across the White River and west to a substation located on the portal area. If developed in conjunction with the Rangely site, a 138-kV line would be routed from the plant site along the refuse haul road to the portal area (see figure 2-13).

Water for the Deserado Mine would be obtained from the White River through four small-diameter alluvial wells drilled adjacent to the White River. With the mine operating to supply coal for one unit at the power plant, up to 152.4 acre-feet of water per year would be removed (304.8 acre-feet per year maximum for 2 units) from the river system through these alluvial wells and piped to the portal area through a 12-inch diameter water pipeline (figure 2-13). The water budget for a one-unit power plant supply is shown in figure 2-15. MLEA presently holds a consumptive water right for 4,344 acre-feet (6 cfs) per year on the White River in Colorado. The point of diversion for this right is presently along the White River immediately west of the Town of Rangely and a change in point of diversion would be required.

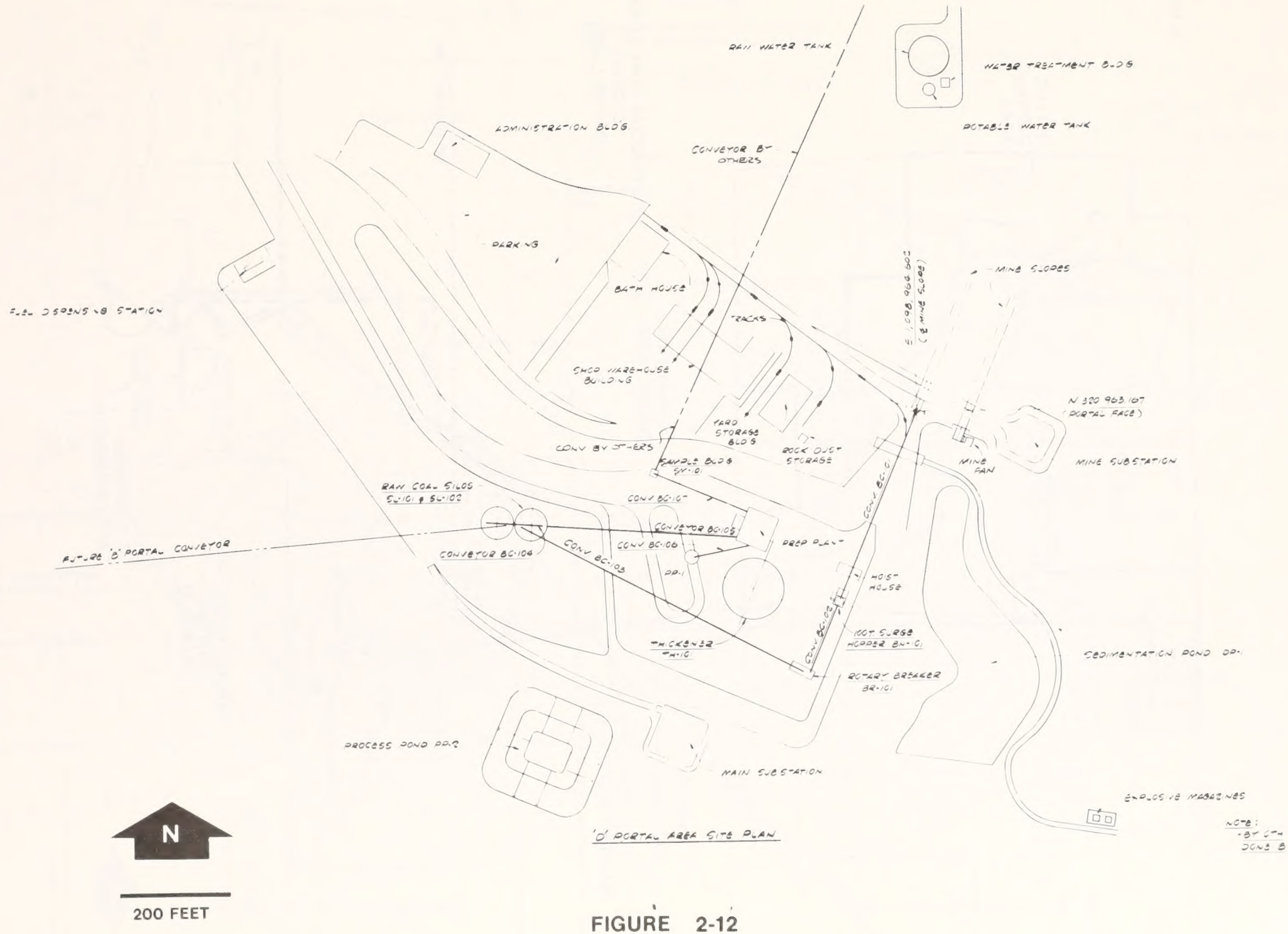


FIGURE 2-12

DESERADO MINE PORTAL LAYOUT

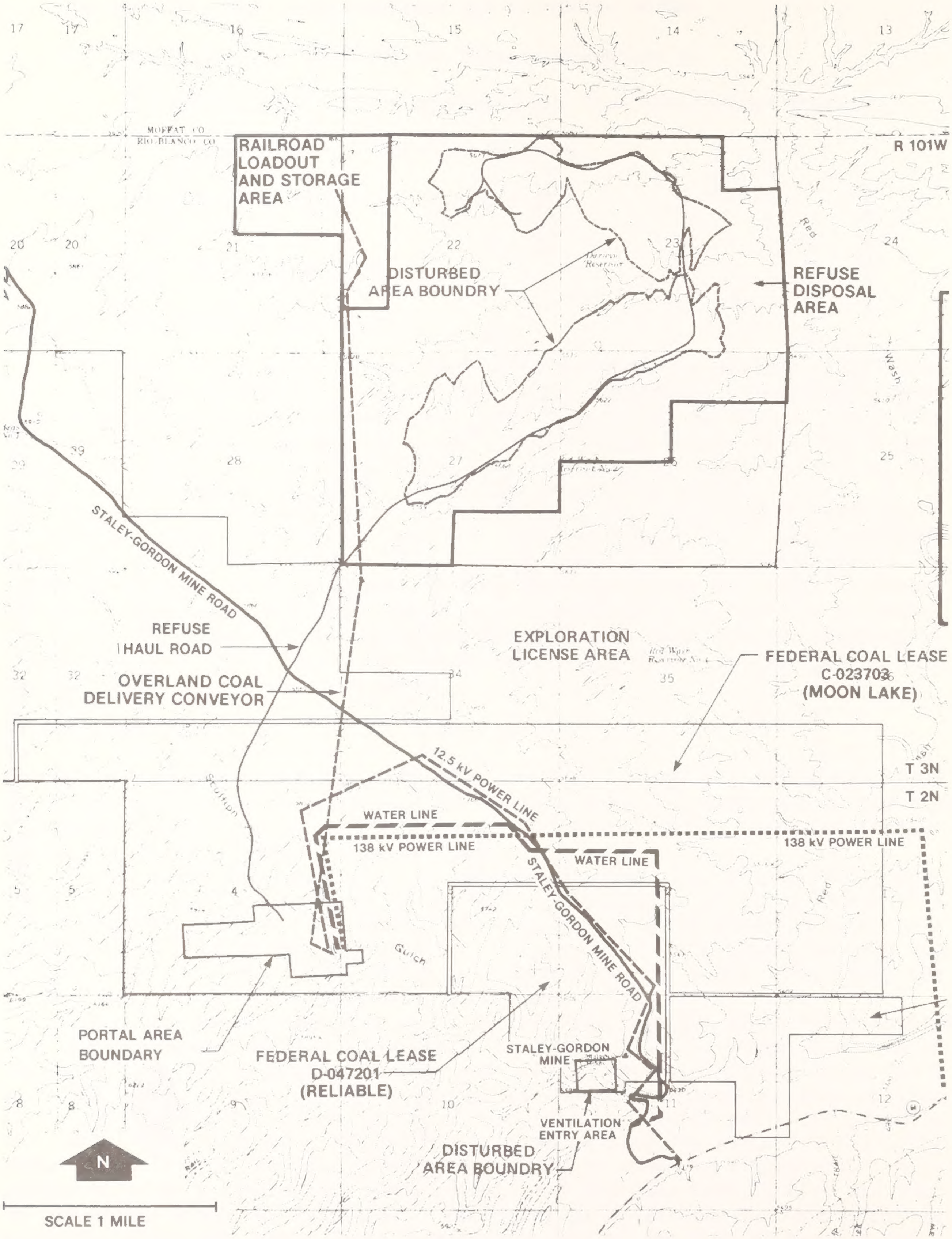
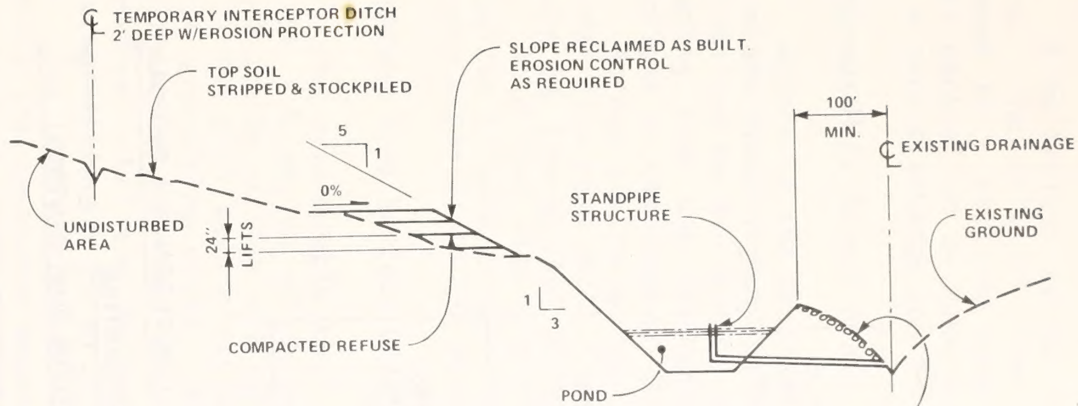


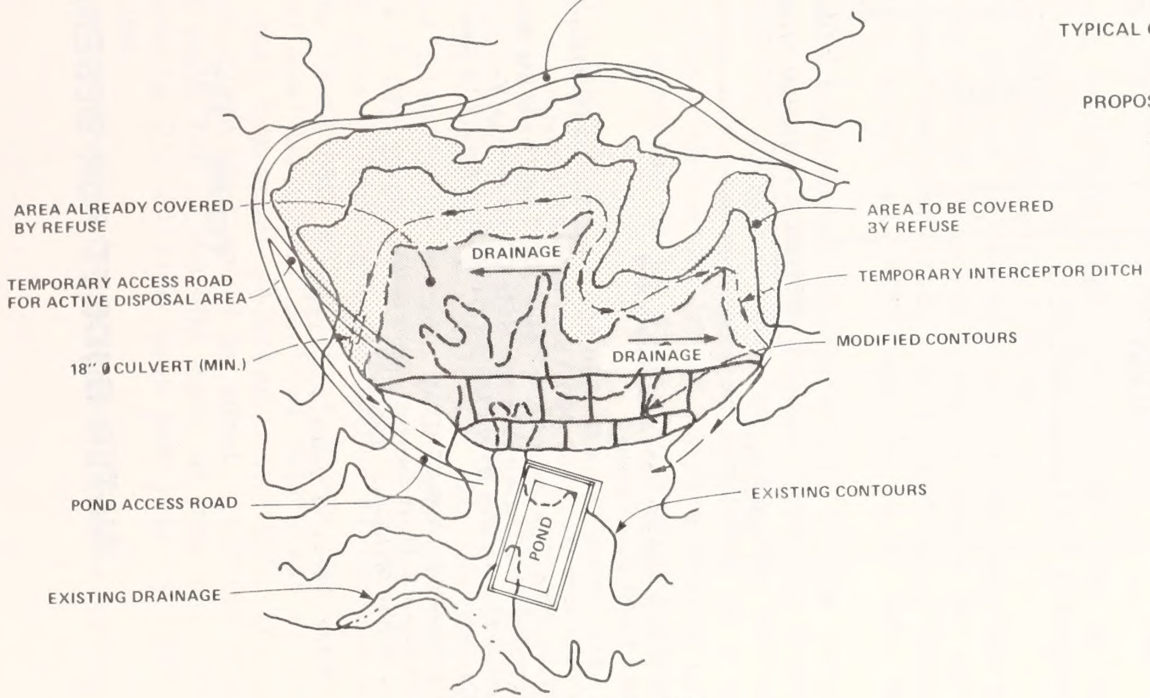
FIGURE 2-13

REFUSE DISPOSAL AREA

NOT TO SCALE



TYPICAL CROSS SECTION ACTIVE REFUSE SITE



TYPICAL PLAN ACTIVE REFUSE SITE

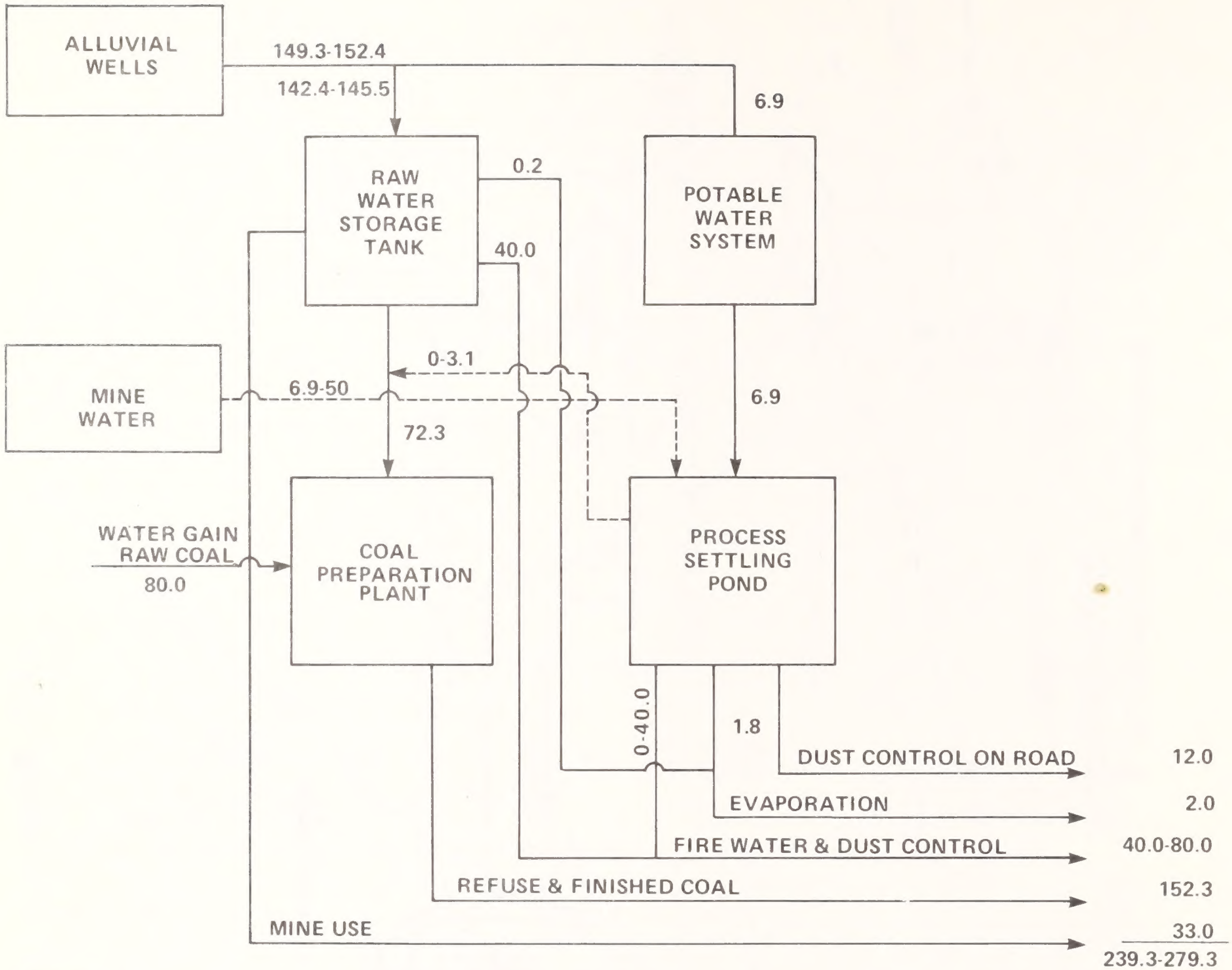
PROPOSED REFUSE DISPOSAL AREA DEVELOPMENT PLAN

SUB-AREA	AREA (Acres)	ESTIMATED REFUSE CAPACITY (Acre-Feet)
1	36	450
2	77	1150
3	113	2000
4	21	300
5	12	150
6	29	400
7	33	400
8	15	200
9	39	500
10	134	2400
11	30	400
12	70	1050

Source: Ford, Bacon & Davis, Oct. 1979

FIGURE 2-14

DETAIL REFUSE DISPOSAL AREA



NOTES:

1. Numbers in acre feet per year except as noted
   Assumes a 1-unit power plant.
2. Water Loss; Refuse Based On 550,000 Tons/Yr @ 18% Moisture.
   Clean Coal Based On 1,350,000 Tons/Yr @ 8% Moisture.
3. Water Gain; Raw Coal Based On 1,800,000 Tons/Yr @ 6% Moisture.
4. Evaporation Based On An Average Rate Of 33 Inches/Yr
5. Flow Rates Shown Are Based On 16 Hour/Day And 225 Day/Yr
6. Pump Capacities
   - Alluvial Wells - 4 @ 65 GPM
   - Washdown & Dust Control - 260 GPM
   - Raw Water Make-up - 235 GPM

Source: Ford, Bacon & Davis, Feb. 1980

FIGURE 2-15

WATER BUDGET FOR DESERADO MINE

A mechanical sewage treatment plant would be constructed at the portal area. The effluent from the plant, approximately 8,000 gal/day, would be pumped to a settling pond. Water from this pond would be used for fire or dust control or as make-up water for the coal preparation plant. This would be a zero discharge operation.

Deserado Mine Access Roads

Access to the Deserado Mine area is from U.S. Highway 40 on the north and Colorado State Highway 64 on the south. The Staley-Gordon Mine road, which is maintained by Rio Blanco County, connects the two highways. Unimproved roads leading from the Staley-Gordon Mine road presently provide access to all portions of the Deserado Mine.

Access to the portal area for employees would be provided by the Staley-Gordon Mine road north from Colorado Highway 64. Heavy equipment for the mine would be transported south on the Staley-Gordon Mine road from Highway 40.

A 58-foot-wide graveled refuse haul road, about 6 miles long, would be required (figure 2-13). It would be used by 35-ton dump trucks to transport refuse material to the refuse disposal site.

Deserado Mine Surface Coal Handling Operations

The recoverable coal would be transported out of the mine on conveyor belts. A series of conveyor belts would then be used to transport coal through the various storage and preparation facilities.

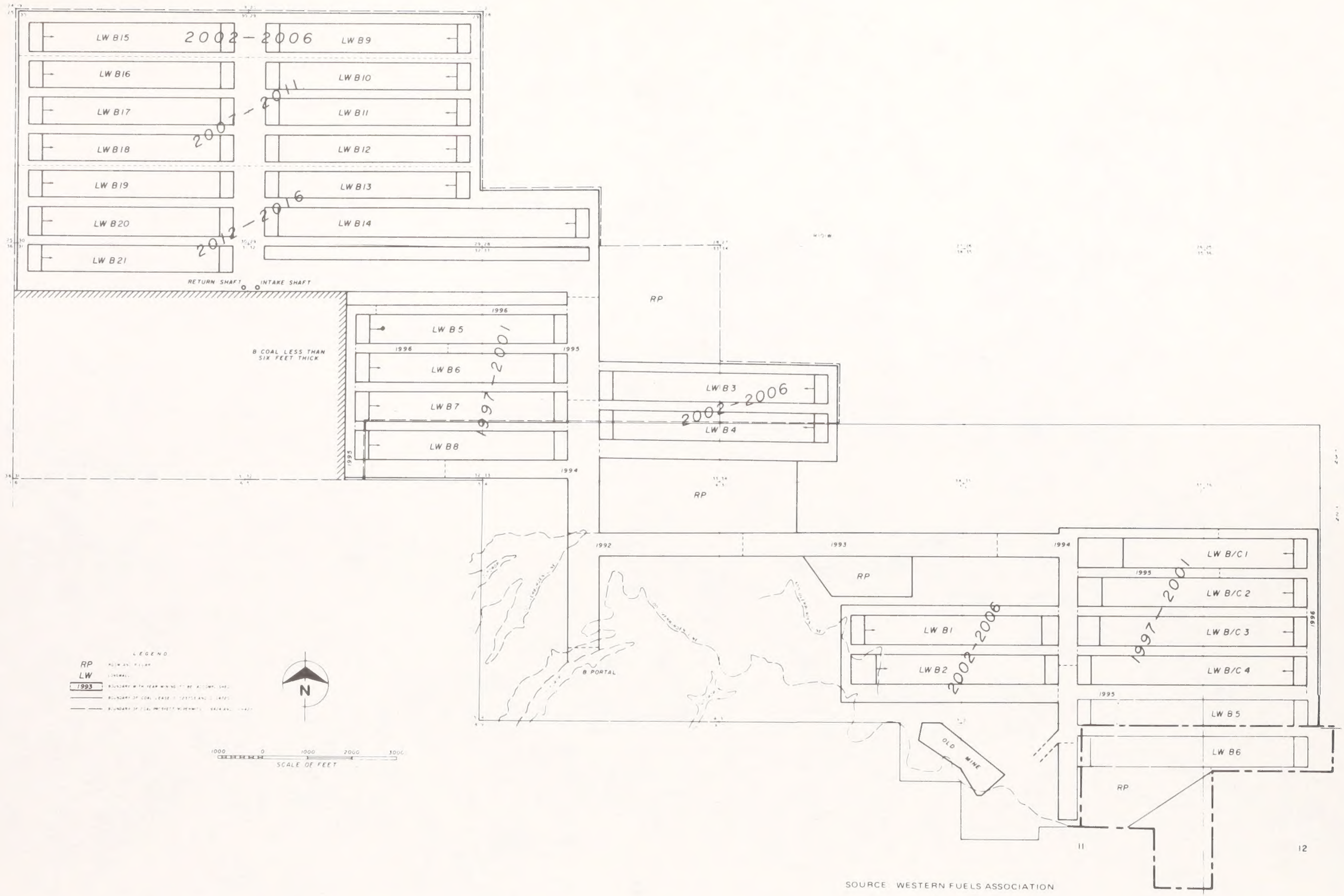
The coal wash plant would produce approximately 450,000 tons per year of coal processing waste. At the refuse disposal area it would be spread in approximately 24-inch-thick layers and compacted. This layering process would continue until the maximum fill height was achieved (40 to 50 feet maximum, average thickness 20 to 25 feet).

The landfill operation would progress in approximately 5-acre increments. Before the operation began, all topsoil would be removed from the 5-acre section and stockpiled. This topsoil would be replaced once the maximum fill depth was achieved, and the area would be revegetated according to a reclamation plan drawn up in conjunction with the Office of Surface Mining (OSM) and BLM. No more than 10 acres is expected to be disturbed within a given year.

Deserado Mine Underground Mining Operation

A combination of room-and-pillar and longwall mining would be used. A mine plan and sequence are illustrated in figures 2-16 and 2-17. Initial coal production would occur in the third quarter of 1983, and 126,000 tons of clean coal would be trucked to the plant site during a 3-month period of 1983. Based on 23-ton trucks and a 5-day work week, about 91 truckloads per day would be shipped to the plant site. The route and method of hauling would be as described in the on-highway truck haul alternative in the Coal Transportation section. This movement of coal would be required regardless of the plant site or long-term method of coal transport selected. In 1985, the capacity for total annual production of clean coal would be about 1,428,000 tons which would exceed the anticipated need for 1,350,000 tons at the one-unit power plant. This could be increased to 2.7 million tons per year by 1987, should unit 2 be completed at that time.

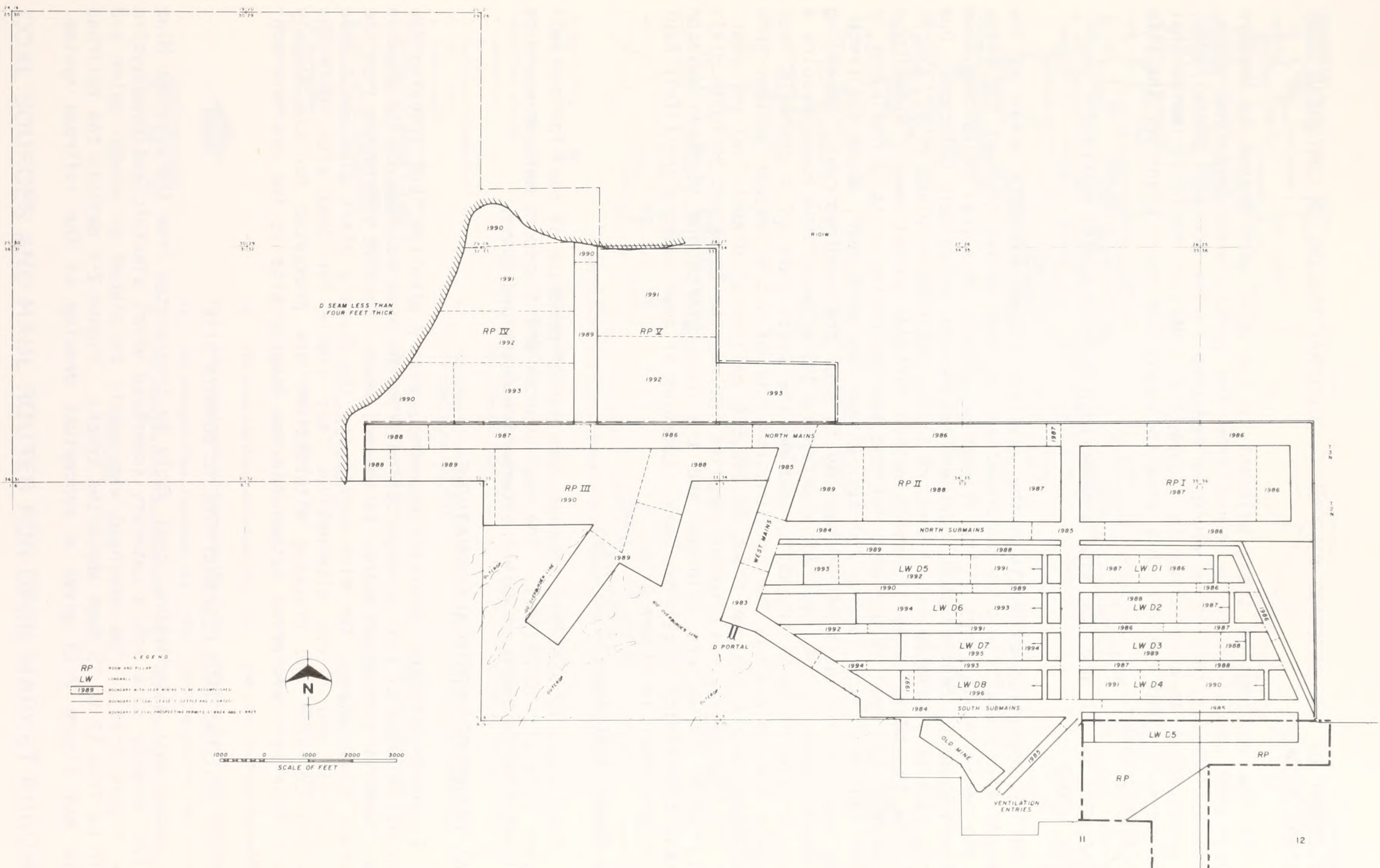
Mine drainage equipment would dewater the mine and minimize safety hazard to workers or equipment.



SOURCE: WESTERN FUELS ASSOCIATION

FIGURE 2-16

UNDERGROUND MINE LAYOUT-B/C SEAM



SOURCE: WESTERN FUELS ASSOCIATION

FIGURE 2-17

UNDERGROUND MINE LAYOUT- D SEAM

DEVELOPMENT OF THE DESERADO MINE WITH ADDITIONAL LEASING ON CONTIGUOUS COAL EXPLORATION AREAS

If the exploration areas adjacent to the mine were leased by Western Fuels, they would likely be mined from the portal area described above. Additional surface facilities would be required in the 100-acre portal area. The exploration area is shown in figure 2-2. Western Fuels estimates that there is sufficient coal in this area to supply the power plant for the life of the project.

DEVELOPMENT OF THE DESERADO MINE SUPPLEMENTED BY OPEN MARKET PURCHASE FOR 15 YEARS

After depletion of coal on the existing leases and PRLA areas at the Deserado Mine, coal could be purchased on the open market to meet the needs for the remaining 15 years of the 35-year project. This coal could come from southern Wyoming, central Utah, northern New Mexico, or western Colorado. Due to the lack of available rail transport to the alternative plant sites, trucks would be the most likely transport method for open market coal. Assuming a 2.7-million-ton coal requirement for the two generating units at the plant, a 23-ton capacity truck, and a 250-day, 8-hour day work year, about 470 truck-loads would be on the road per workday to haul the required coal. Depending on the distance to the coal sources (up to 285 miles), this could require a fleet of 470 or more trucks. Assuming the worst case of a 285-mile haul distance and an average fuel consumption rate of 4.5 miles per gallon, this alternative would consume about 14,885,886 gallons of diesel fuel per year.

The most likely open market supplies include the Yampa and Danforth Hills coal fields in western Colorado and the Book Cliffs and Northern Wasatch Plateau coal fields in central Utah. Location of coal sources and likely haul routes are shown in figure 2-18.

OPEN MARKET PURCHASE FOR 35 YEARS

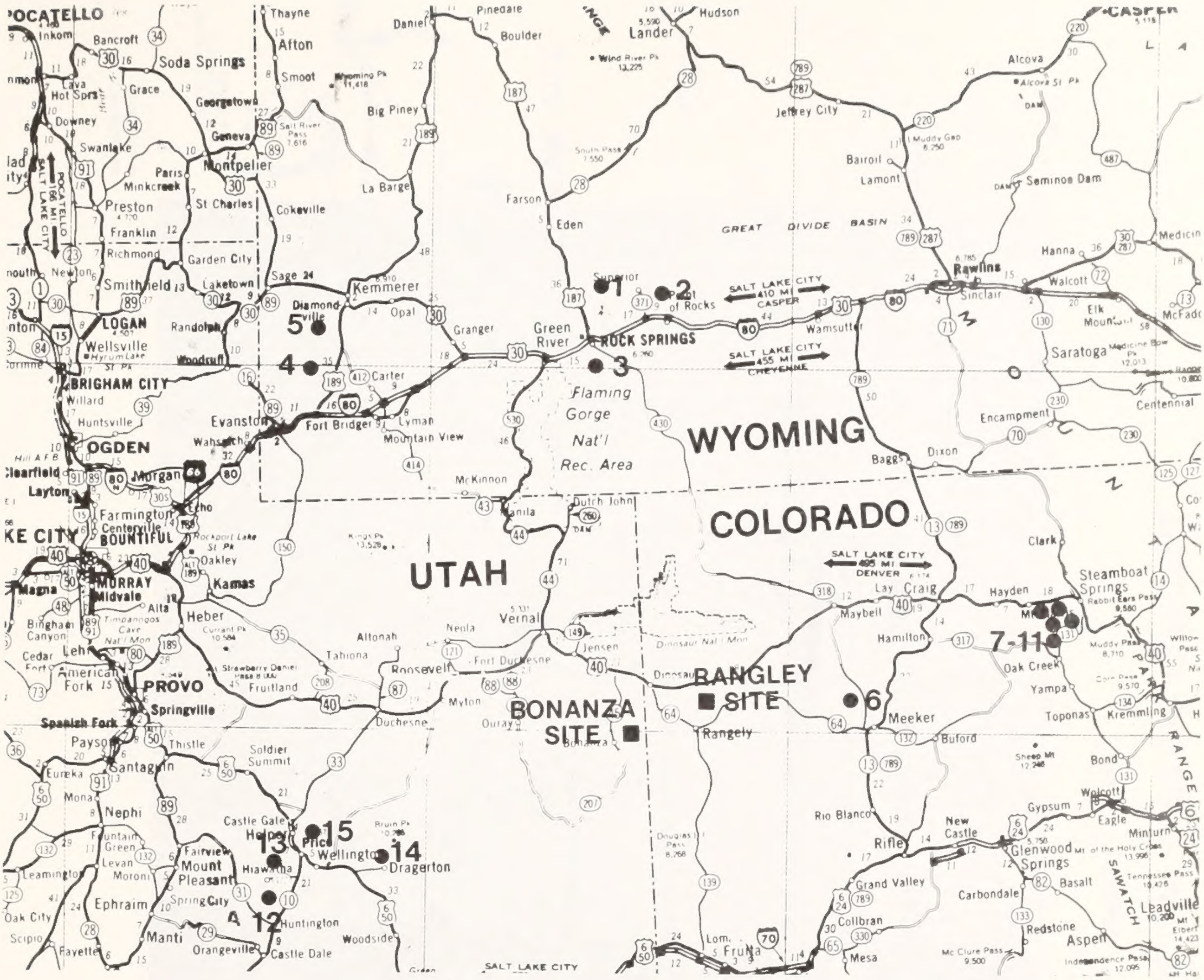
Coal could be supplied through open market purchase of coal for the full 35-year life of the project. The coal sources and transport methods would be as identified in the open market alternative described above.

COAL TRANSPORTATION ALTERNATIVES

Electric railroad, overland conveyor, slurry pipeline, and trucking are alternative modes of coal transportation from the Deserado Mine to the Bonanza site. Deseret's proposed method is the railroad. Because subsidence from the Deserado Mine between the mine portal and the Rangely plant site would make the railroad and slurry alternatives less viable for that site, only the overland conveyor and trucking alternatives are presented for the Rangely site. Deseret's preferred method for the Rangely site is the overland conveyor.

ELECTRIC RAILROAD FROM DESERADO MINE TO BONANZA SITE

Under this alternative, coal would be transported from the Deserado Mine to the Bonanza site via a catenary (overhead wire) electric railroad system (see figure 2-19). The overhead wire would be placed on wooden poles and would be from 12 to 15 feet above the tracks. Figure 2-2 depicts the railroad route and figure 2-20 gives a conceptual drawing of the railroad system.



APPROXIMATE DISTANCE (MILES)--COAL SOURCE TO PLANT SITE ON ALL WEATHER ROADS

PLANT SITES ■
COAL SOURCES ●

POTENTIAL COAL SOURCE (EXISTING MINES)

1 Stransbury
2 Bridger
3 Rainbow-Columbine
4 Skull Point
5 South Block
6 Sewanee (Rienau No. 2 Mine)
7 Energy Fuel (Mines 1, 2 and 3)
8 Peabody Coal Co. (Seneca 2)
9 Pittsbury and Midway (Edna Mine)
10 Sun Coal Co. (Meadows 1)
11 Sunland (Apex No. 2)
12 Castle Dale
13 Huntington
14 Sunnyside
15 Castle Gate

N

0 - 10 - 20
SCALE IN MILES

BONANZA SITE

Source	Miles
1	193 miles (via Vernal, Ut.) 285 miles (via Craig, Co.)
2	209 miles (via Craig, Co.) 259 miles (via Craig, Co.)
3	188 miles (via Vernal, Ut.) 280 miles (via Craig, Co.)
4	281 miles (via Vernal, Ut.)
5	271 miles (via Vernal, Ut.)
6	122 miles (via Meeker, Co.)
(7-11)	169-189 miles (via Craig, Co.)
12	194 miles (via Price/-Duchesne, Ut.)
13	180 miles (via Price/-Duchesne, Ut.)
14	182 miles (via Price/-Duchesne, Ut.)
15	150 miles (via Price/-Duchesne, Ut.)

RANGLEY SITE

Source	Miles
1	205 miles (via Vernal, Ut.) 263 miles (via Craig, Co.)
2	221 miles (via Vernal, Ut.) 237 miles (via Craig, Co.)
3	200 miles (via Vernal, Ut.) 258 miles (via Craig, Co.)
4	293 miles (via Vernal. Ut.)
5	283 miles (via Vernal, Ut.)
6	77 miles (via Meeker, Co, Co.)
(7-11)	147-157 miles (via Craig, Co.)
12	206 miles (via Price/-Duchesne, Ut.)
13	192 miles (via Price/-Duchesne, Ut.)
14	184 miles (via Price/-Duchesne, Ut.)
15	162 miles (via Price/-Duchesne, Ut.)

FIGURE 2-18

COAL SOURCES AND HAUL ROUTES FOR OPEN MARKET PURCHASE

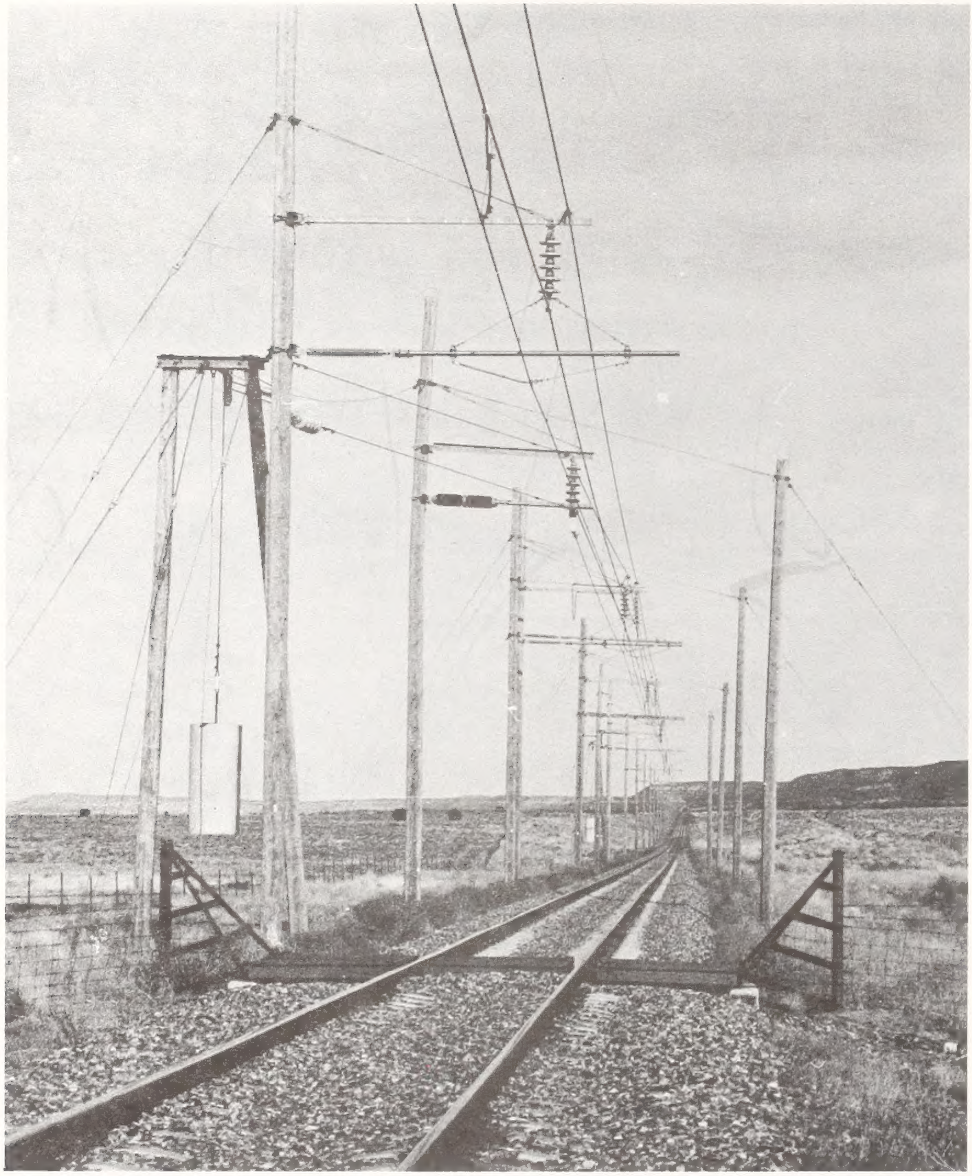


FIGURE 2-19

DETAIL OF CATENARY RAILROAD SYSTEM

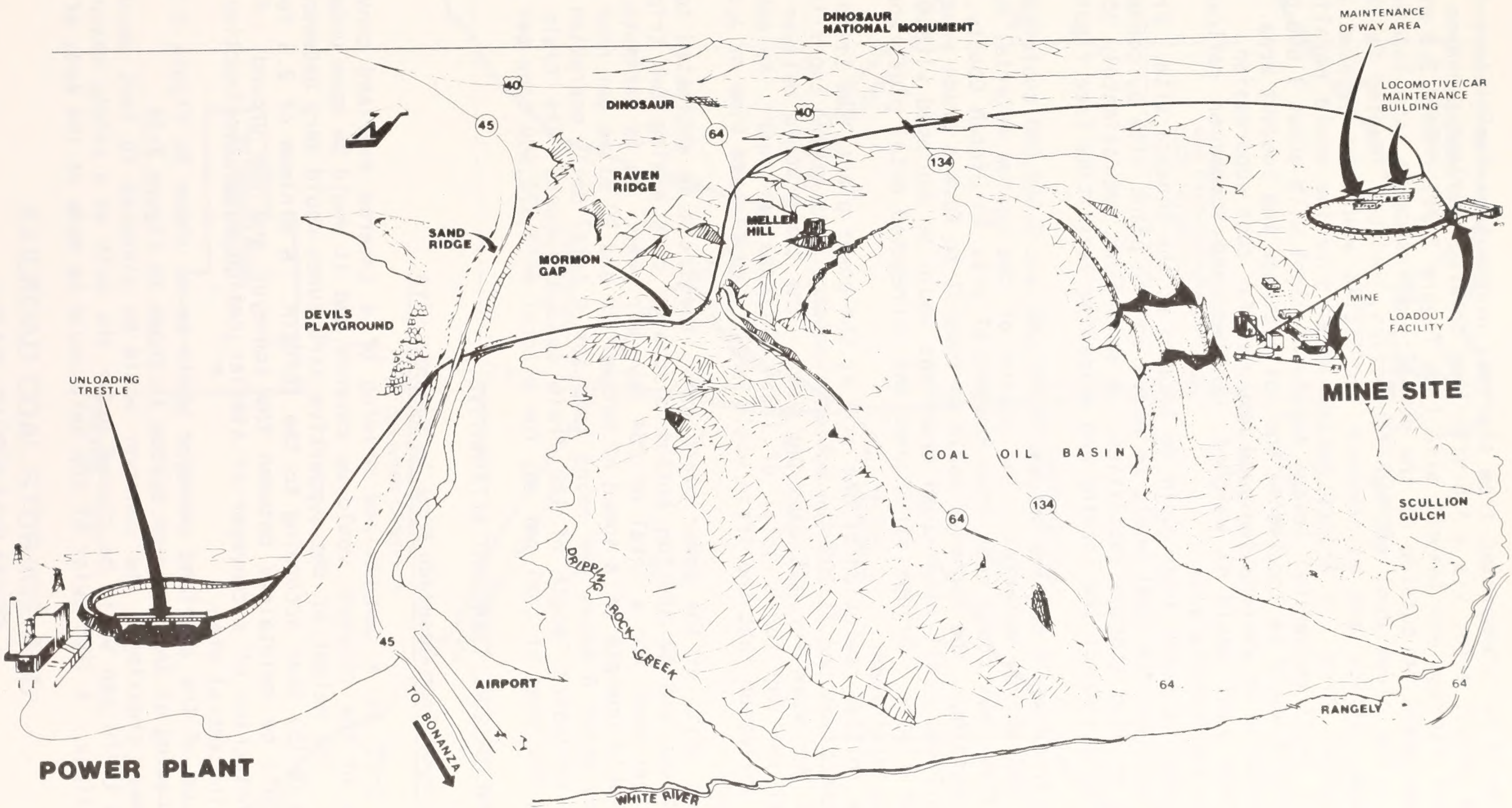


FIGURE 2-20

RAILROAD SYSTEM ROUTING CONCEPT

Coal would be transported from the coal preparation facilities, located at the mine portal area, via a 3.5-mile-long covered overland conveyor to the 256-acre coal storage and loadout area (see figure 2-21). Only 2.8 miles of the conveyor would be outside of the portal, coal storage, and loadout area boundaries. The clean coal storage facilities, railcar loading facilities, railroad loop, office and maintenance facilities would be located at the railroad loadout area. A 4-inch buried water pipeline would parallel the conveyor. A small mechanical sewage treatment plant with about 1,000 gallons per day effluent would be located on the coal storage and loadout area. Water would be pumped to an evaporation pond and used for dust suppression.

The clean coal would be weighed, sampled, and loaded on railcars for transport to the Bonanza site.

The unloading track loop would be located at the Bonanza site. From the unloading facility, the coal would be moved on the plant site by conveyor to either live or dead storage facilities. A main line, approximately 35 miles in length, would connect the loading and unloading facilities (see figures 2-2 and 2-3).

The railroad would require between 8,000,000 and 9,000,000 cubic yards of cut, fill, and borrow material. The source of the borrow material has not been identified, but could come from commercial pits in Uintah County, Utah. At highway crossings, the highways would be rebuilt to form a grade separation over the railroad. All other road crossings would be equipped with warning signs and/or lights. Bridge structures and corregated metal pipes would be used to cross drainages.

For the initial operation of one unit at the power plant, the train would have two locomotives and 31 100-ton bottom discharge cars making two trips per day, 5 days per week for 220 days per year. The train would deliver 6,200 tons of coal per day for a total of 1,364,000 tons per year. To make one trip, it is estimated that the train would require an elapsed time of approximately 4 hours.

With two units at the power plant site, the train is estimated to have four locomotives and 52 100-ton bottom discharge cars making two trips per day, 6 days per week for a total of 264 days per year. It is estimated that this train would operate at a speed of between 20 and 30 miles per hour which would require about 6 hours per round trip for a total daily operation of 12 hours. The estimated length of the train is 3,100 feet. The train would transport 10,500 tons of coal per day for a total of 2,772,000 tons per year.

OVERLAND CONVEYOR COAL TRANSPORT ALTERNATIVE

Overland Conveyor From Deserado Mine to Bonanza Site

Figure 2-22 is a generalized drawing of a covered overland conveyor. Only the top of the conveyor would be covered and it would be open under the belt guides. The height of the supportive structures would vary between 8 to 150 (average 8-15) feet according to the terrain. A minimum of 2.5 feet of clearance would be maintained between the conveyor and the ground. Figure 2-23 is a photograph of a conveyor of similar design under construction at a power plant in central Utah.

The route of the overland conveyor would be as shown in figure 2-2. A conceptual drawing of the conveyor system is shown in figure 2-24.

At highway crossings, the conveyor would be elevated 16 feet above the pavement. A catch pan would be placed under the belt as a safety measure at highway crossings. A 180° twist of the belt would be made at the ends of each

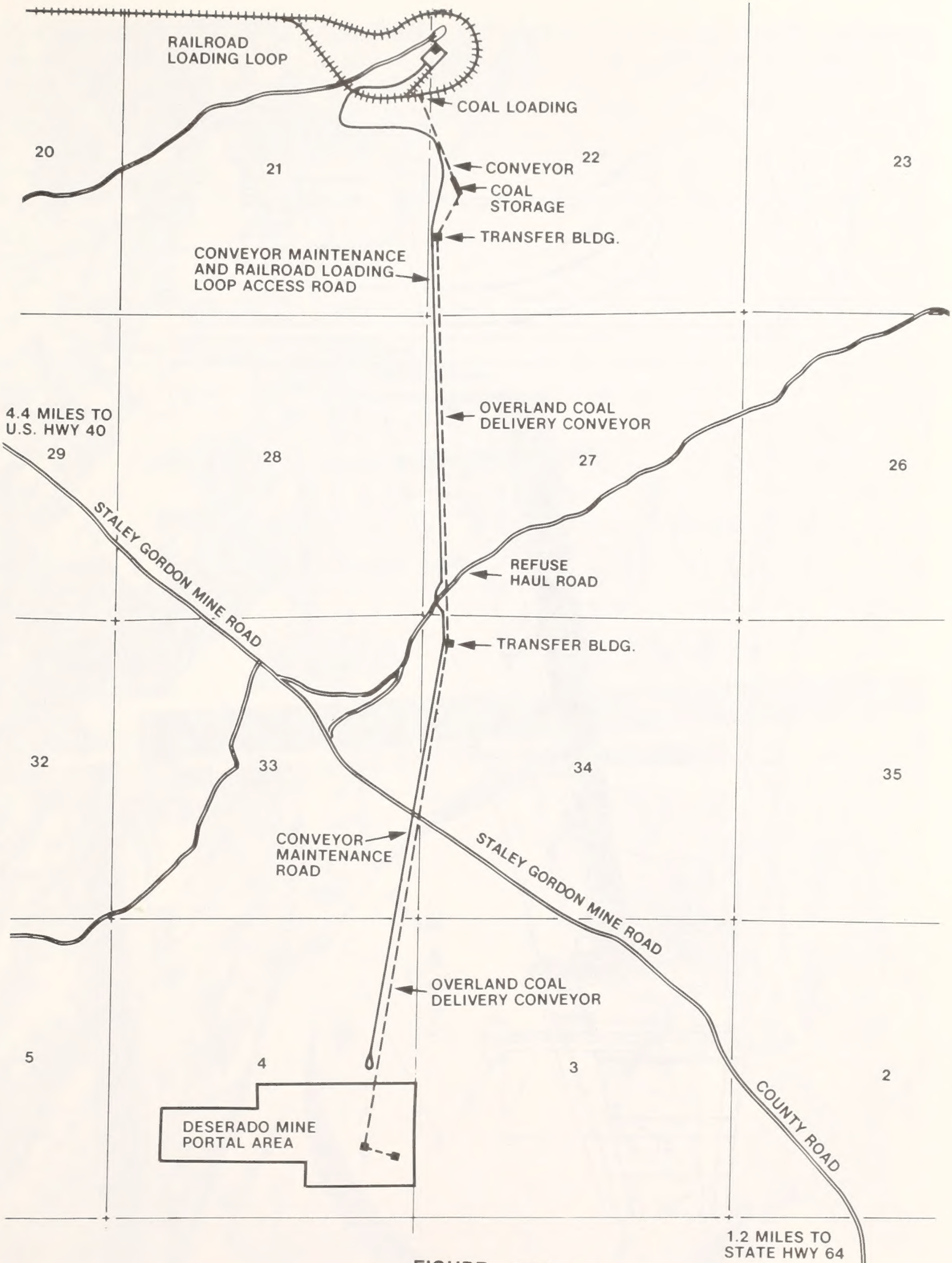


FIGURE 2-21

RAILROAD COAL STORAGE AND LOAD OUT FACILITIES

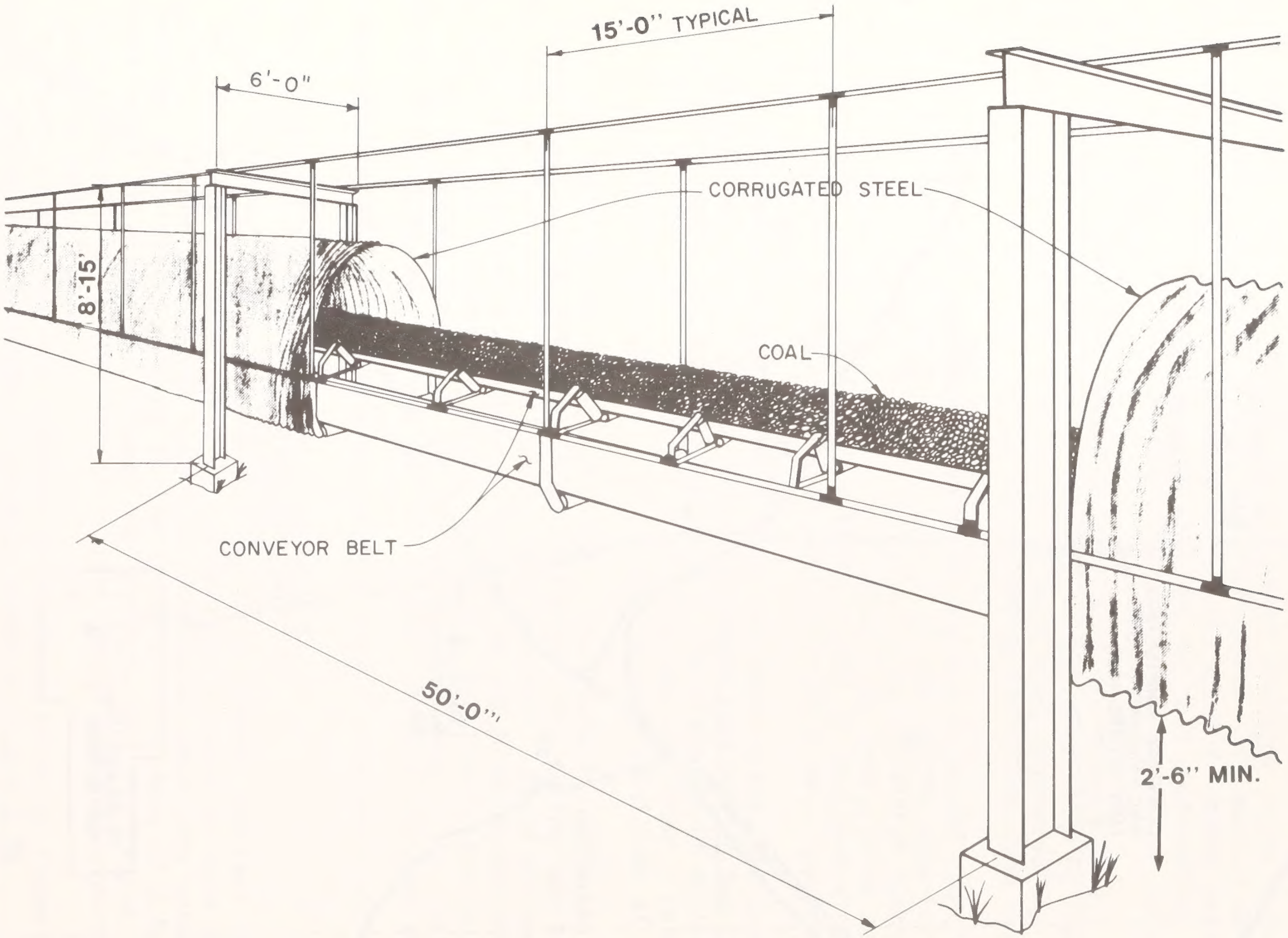


FIGURE 2-22
DESIGN OF COAL CONVEYOR

FIGURE 2-23

OVERLAND COAL CONVEYOR UNDER CONSTRUCTION

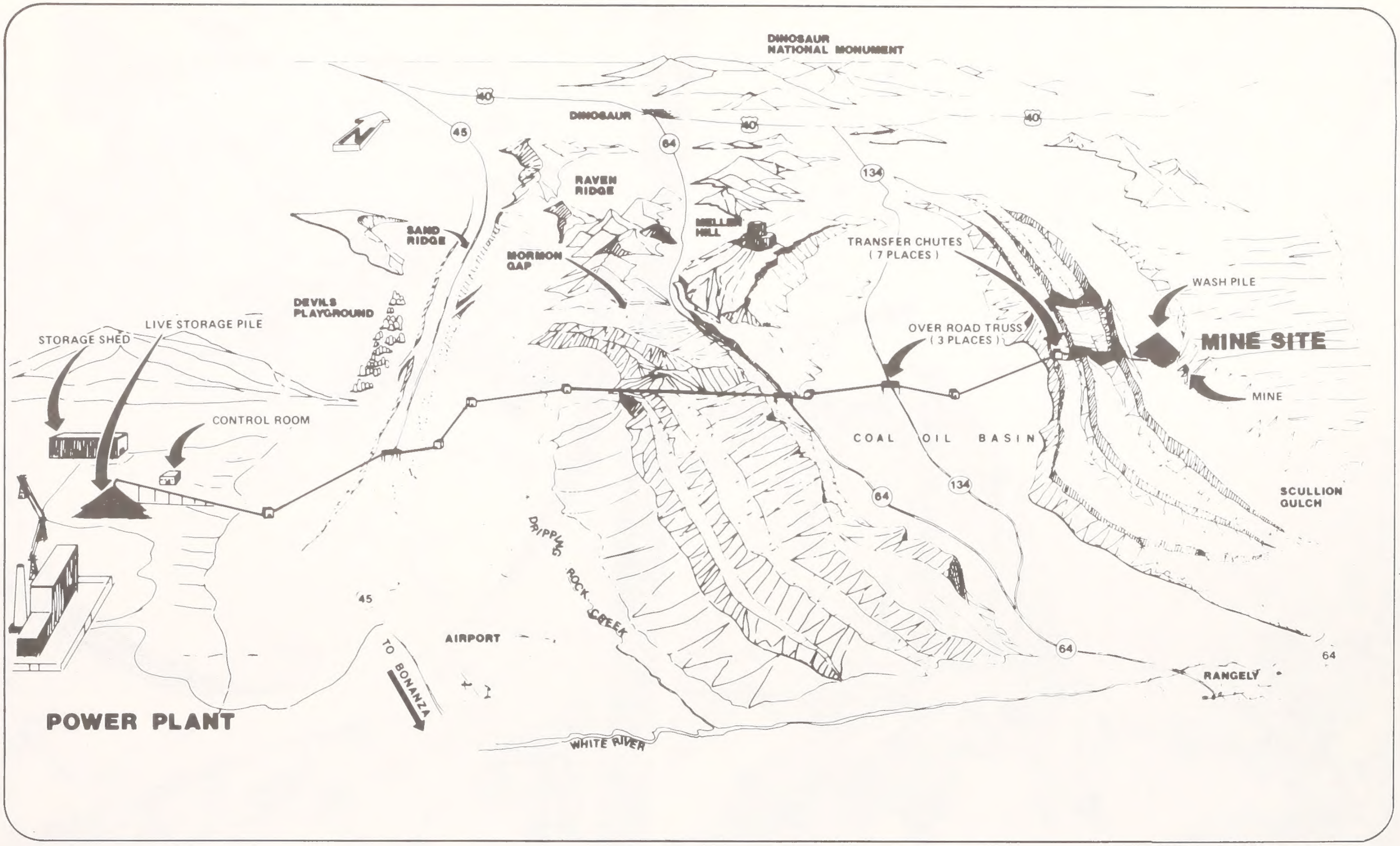


FIGURE 2-24

CONVEYOR SYSTEM ROUTING CONCEPT

individual length (flight) to insure that the dirty (coal covered) side of the belt would always face upward. At dirt and graveled road crossings, the conveyor would be placed in a culvert below the road.

The total length of the conveyor from the portal area to the center of the Bonanza site would be 31 miles, 29 miles of which would be outside of the portal area and plant site boundaries. It would consist of nine flights connected by eight enclosed transfer stations. Buildings 50 feet square and 30 feet high would be placed at each transfer point. The transfer stations would contain conveyor drives, switchgear, and all necessary devices for transferring coal from one belt to another. The station would be insulated and vented with a fan. Coal transported on the conveyor would still be wet from the washing process which would reduce dust emissions. Provisions would be made to add baghouses at the transfer stations if dust were a problem. A 16-foot-wide graveled access road would be required alongside the conveyor.

The electric power for the transfer stations would be supplied by building a 25-kV distribution line parallel to the conveyor.

The conveyor system would be controlled and monitored from one central panel. A series of alarms would sound along the entire route before the system started operation. A safety system would shut down the entire conveyor system if any of the equipment failed to operate properly.

The conveyor would be started once each week and would run continuously until the scheduled amount of coal for that week was delivered. For the first unit of the power plant, the conveyor would be operated for approximately 3.5 days per week at 500 feet per minute (fpm). The conveyor would be operated at a higher speed (800 fpm) for 5 days per week when the second unit of the power plant came on line.

Overland Conveyor From Deserado Mine to Rangely Site

A conveyor from the Deserado Mine to the Rangely site would consist of two flights with a total length of about 4 miles. About 2 miles would be outside the plant site and portal area boundaries. The proposed route is shown in figure 2-2. The design and specifications of the conveyor would be as described for the Bonanza site conveyor (figure 2-22). A 16-foot-wide graveled access road would be required alongside the conveyor. Power would be supplied by a substation located at the Rangely site. The transfer station would receive power from a distribution line constructed along the second flight. For the first unit of the power plant, the conveyor would be operated for approximately 3 days per week at 500 fpm. The conveyor would be operated at 800 fpm for 4.5 days per week when the second unit of the power plant came on line.

SLURRY PIPELINE FROM DESERADO MINE TO BONANZA SITE

This alternative coal supply system could move up to 2,700,000 tons of pulverized coal slurry per year. Slurry would consist of approximately 45- to 48-percent coal and 52- to 55-percent water. This alternative would require a slurry preparation and pumping complex at the mine portal, a buried 12-inch diameter steel pipeline, a slurry storage and dewatering complex on the plant site, and a buried 10-inch diameter water-return pipeline system.

Figure 2-25 is a conceptional drawing of the slurry pipeline system. The slurry pipeline route is shown in figure 2-2.

In normal operation for unit 1, the pipeline would be shut down full of water 50 percent of the time. With completion of unit 2, the pipeline would

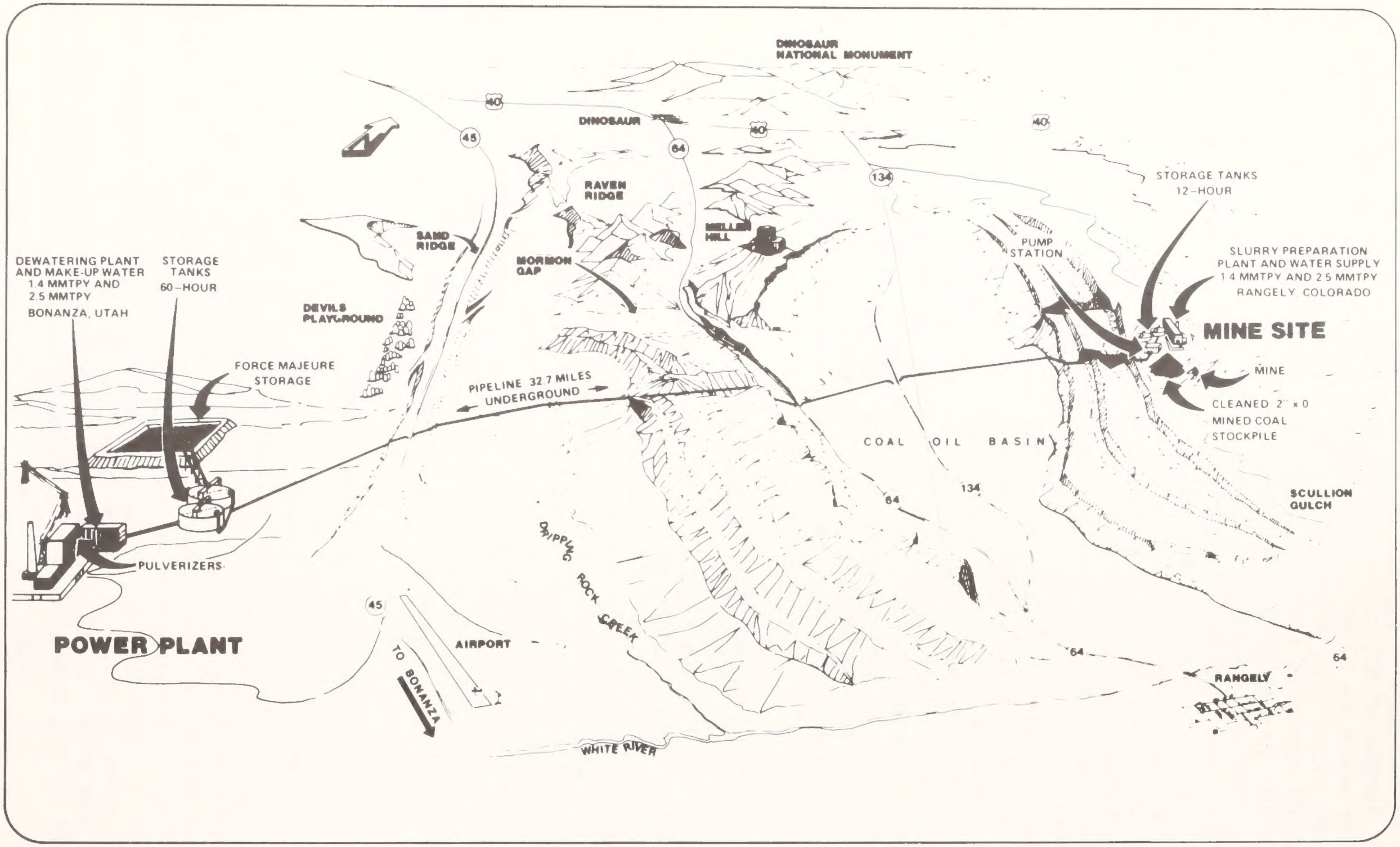


FIGURE 2-25

COAL SLURRY PIPELINE SYSTEM ROUTING CONCEPT

be in operation full time. If an emergency shutdown with slurry in the pipeline were required, the pipeline would be restarted by pumping flush water and a normal pipeline flow rate would resuspend the settled slurry.

The water demand would be approximately 810 acre-feet per year during the initial unit 1 operation, and 1,375 acre-feet per year when unit 2 came on line. This water would most likely be obtained from the White River in Colorado or from a water supply at the plant site which could be derived from the Green River or the White River Dam project in Utah. (See description in Water Supply Alternatives section.)

Deseret (MLEA) presently holds a consumptive water right for 4,344 acre-feet per year (6 cfs) on the White River in Colorado. Assuming use of 152.4 acre-feet for the Deserado coal preparation plant (see Coal Supply Alternatives section) and 1,375 acre-feet for the slurry coal preparation plant, 35 percent of Deseret's 6 cfs White River consumptive right would be utilized. White River water would be moved to the slurry preparation plant and pumping station through a 10-inch diameter underground pipeline.

The States of Utah and Colorado may place restrictions on the transport of water from one state to another via pipeline. If allowed by the states, a water-return pipeline could be installed in two phases that would correspond to unit 1 and unit 2 construction. The water return system would have two pump stations, one located at the power plant and one located near the Colorado state line.

TRUCK HAUL ALTERNATIVE

Coal could be transported to either plant site by truck on existing highways, county roads, or on roads constructed by Deseret.

On-Highway Truck Haul From Deserado Mine to Bonanza Site

From the mine, 23-ton trucks would travel northwest along a graveled refuse haul road 1.5 miles to the Staley-Gordon Mine road. The trucks would basically follow Highway 40 as shown in figure 2-2. A new 32-foot-wide graded roadway from the Bonanza site would be built for 5 miles to intersect this route east of the plant site. A round trip under this alternative would be about 80 miles and take approximately 2 hours and 40 minutes to complete.

Assuming 23-ton trucks, a 5-day-per-week (250 days per year), 8-hour-per-day operation, a truck would pass any given point along the highway every 30 seconds (471 loads per day) to supply sufficient coal for the 2-unit power plant. Depending on the work schedule, up to 157 trucks would be required for this operation.

Off-Highway Truck Haul From Deserado Mine to Bonanza Site

This alternative would involve construction of a 55-foot-wide paved haul road (120-foot-wide right-of-way) from the Deserado Mine to the Bonanza site along the same route as the railroad (figure 2-2). Grades along the road would not exceed about 3 percent. Bridges would be constructed to cross highways and access roads. The total haul distance would be about 38 miles. Trucks with a capacity of 150 tons would be used. Assuming a 250-day work year and an 8-hour day, about 72 round trips (with a fleet of 36 trucks) traveling in each direction would be required to supply the coal necessary for both generating units at the plant site.

Truck Haul From Deserado Mine to Rangely Site

Under this alternative a new coal haul road would be built from the Deserado Mine to the Rangely site. The route would be the same as the access road to the mine refuse disposal site. The haul distance would be about 5 miles. Trucks of 23- and/or 150-ton capacity could be used.

The road design and right-of-way widths would be as described for off-highway truck haulage for the Bonanza site.

WATER SOURCE AND TRANSPORT ALTERNATIVES

Either plant site would require an annual withdrawal of 17,470 acre-feet (24 cfs) (based on two units maximum loading) which, if withdrawn continuously, would be 1,456 acre-feet per month. Maximum monthly water requirements would depend on load characteristics which cannot be accurately predicted. A 10-day to 2-week on-site raw water storage pond of approximately 26 surface acres would be located on the plant site. Regardless of the water source utilized, water would be delivered to the plant site via a 36-inch diameter underground pipeline located in a 70-foot-wide right-of-way. This right-of-way would be located within a 0.25 mile-wide utility corridor. The routes are shown in figure 2-3.

The Green River is the proposed source of water for the Bonanza site and an alternative source of water for the Rangely site. The White River is an alternative source of water that could be used for the Bonanza or Rangely sites. The water source alternatives and their availability to Deseret are complicated by legal issues that revolve around the Endangered Species Act, Utah and Colorado shares of water in the White River, future development of water rights in Colorado, and interstate transport of water. These issues are presented in the unresolved issues section in the summary of this Draft EIS. The discussion of alternatives presented below is in no way a determination of their legal acceptability.

Since the issues related to water supply may be definitely resolved only through legal action, this Draft EIS will describe "technically" feasible alternatives and address their environmental impacts on the flows and salinity of the Green and White Rivers as compared to historical, present, and projected future conditions.

USE OF GREEN RIVER WATER FOR THE BONANZA SITE

The Green River is a firm water supply even in times of extreme drought because of the large upstream storage capacity of Flaming Gorge Reservoir and because Deseret holds an early (1959) water filing.

The proposed water supply system for a power plant at the Bonanza site would consist of a collector well system located near Walker Hollow on the Green River and a 19-mile pipeline to the plant site. This pipeline would require a 1-acre open reservoir on Deadman Bench (figure 2-3). The collector well system would involve nine wells placed approximately 45 feet deep in permeable materials adjacent to the Green River. A typical collector well is shown in figure 2-26.

Near Walker Hollow, a water-bearing alluvium, ranging in thickness from 35 to about 42 feet, extends along the river for about 4,500 feet. The permeability of the aquifer is about 1,300 to 1,470 gal/day/sq. ft. giving it a transmissibility of about 35,300 to 44,400 gal/day/ft.

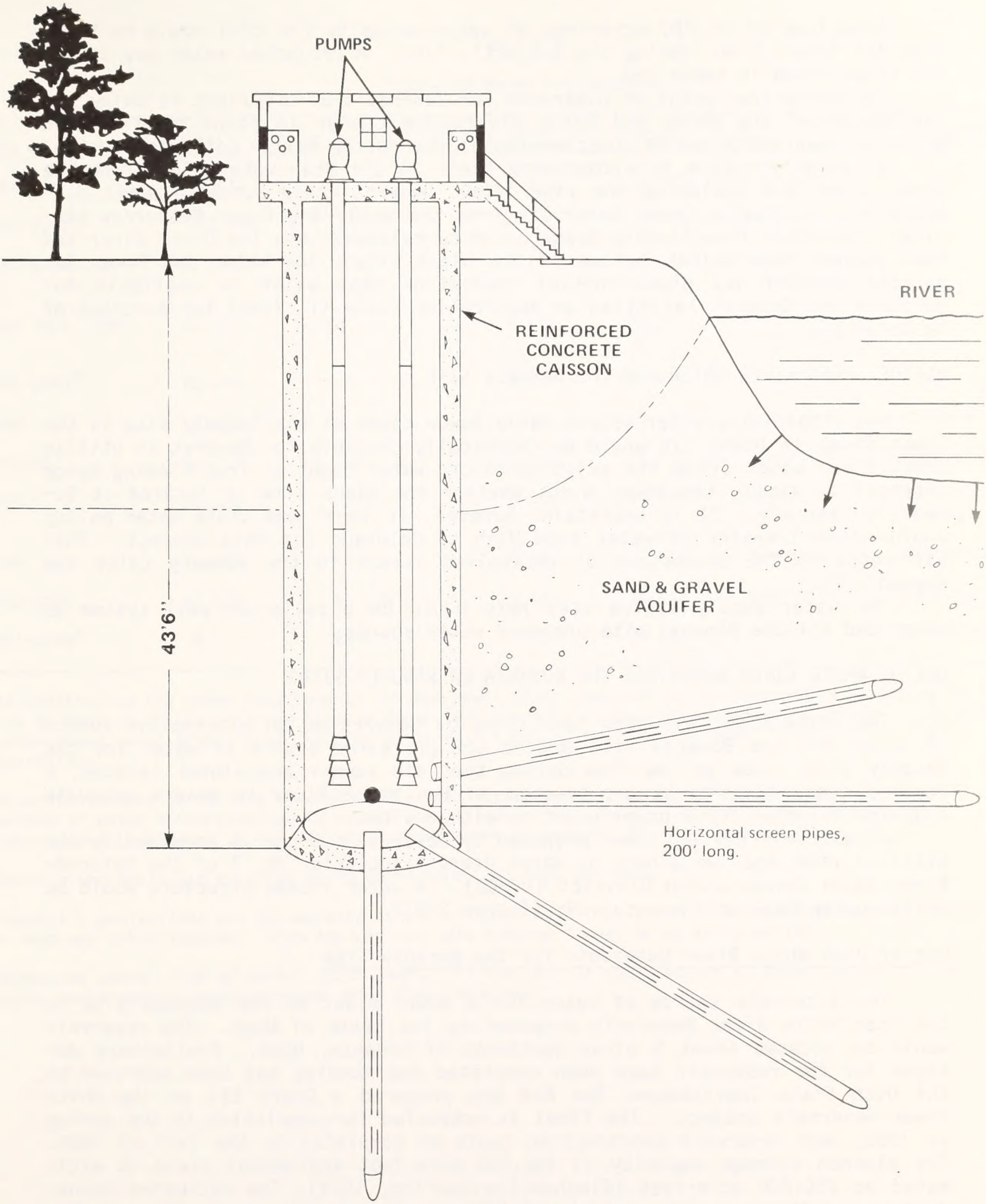


FIGURE 2-26

WATER COLLECTOR WELL

A maximum of 21,720 acre-feet of water annually (30 cfs) could be taken from the Green River during the project's life. A projected water use schedule is provided in table 2-4.

The authorized point of diversion for Deseret's 30 cfs right is below the confluence of the White and Green Rivers. A change in point of diversion would be required prior to construction of the Walker Hollow collector system.

As an alternative to withdrawing their 30 cfs Utah water right from the Green River and depleting the river flow, Deseret could purchase water directly out of Flaming Gorge Reservoir from the Water and Power Resources Service. The water from Flaming Gorge could be released into the Green River and then pumped from Walker Hollow to the plant site. The Water and Power Resources Service has given initial indication that water is available for purchase and Deseret has filed an application (July 11, 1980) for purchase of up to 30 cfs.

USE OF GREEN RIVER WATER FOR THE RANGELY SITE

One alternative water source for a power plant at the Rangely site is the Green River in Utah. It would be technically possible for Deseret to utilize Green River water (from its existing 30 cfs water right or from Flaming Gorge storage) to supply the power plant whether the plant site is located at Bonanza or Rangely. It is uncertain, however, if legal and state water policy would allow transfer of water from Utah to Colorado for this project. This was noted in the discussion of unresolved issues in the Summary (also see Appendix 2).

The water supply system used here would be a collector well system as described for the Bonanza site proposed water source.

USE OF WHITE RIVER WATER FOR THE BONANZA OR RANGELY SITES

The White River has been identified by Deseret as an alternative source of water for the Bonanza site and as the preferred source of water for the Rangely site. Due to low flow during the late summer and winter seasons, a reservoir may have to be constructed on the White River to ensure adequate supplies of water for a power plant at either site.

A reservoir has not been proposed by Deseret, but one is proposed by the State of Utah and two others by Water Users Association No. 1 of the Colorado River Water Conservation District (CRWCD). A water intake structure would be built on the bank of the reservoir (figure 2-27).

Use of Utah White River Reservoir for the Bonanza Site

The alternate source of water for a power plant at the Bonanza site is the Utah White River Reservoir proposed by the State of Utah. The reservoir would be located about 5 miles southwest of Bonanza, Utah. Preliminary designs for the reservoir have been completed and funding has been approved by the Utah State Legislature. The BLM has prepared a Draft EIS on the White River Reservoir project. The Final is scheduled for completion in the spring of 1982, and reservoir construction could be completed by the fall of 1984. The planned storage capacity is 105,000 acre-feet and annual yield is estimated as 250,000 acre-feet (Bingham Engineering, 1979). The estimated annual drawdown on the reservoir would be 67,000 acre-feet for the White River Shale, TOSCO, and Moon Lake projects combined.

TABLE 2-4

Projected Water Use Schedule

Date of Use	Quantity Unit 1	Quantity Unit 2	Quantity Companies[a]	Quantity Total	Purpose Unit 1	Purpose Unit 2
1981	1+ cfs	0	6 cfs	7+ cfs	Earthwork	--
1982-1983	1/2 cfs	0	6 cfs	7 1/1 cfs	Construction	--
June-Aug. 1984	1 cfs	0	6 cfs	7 cfs	Preliminary Testing	--
Sept.-Oct. 1984	12 cfs	0	6 cfs	18 cfs	Startup and full testing	--
1985-1989[b]	12 cfs	0	6 cfs	18 cfs	Operation	--
1990[c]	12 cfs	1 cfs	6 cfs	19 cfs	Operation	Earthwork
1991-92	12 cfs	1/2 cfs	6 cfs	18 1/2 cfs	Operation	Construction
1993	12 cfs	1 cfs	6 cfs	19 cfs	Operation	Preliminary Testing
1994	12 cfs	12 cfs	6 cfs	30 cfs	Operation	Operation
1995-2020	12 cfs	12 cfs	6 cfs	30 cfs	Operation	Operation
2021-2030[d]	0	12 cfs	6 cfs	18 cfs	--	Operation

[a]In addition to the water requirements for the power plant, Deseret may be required to supply up to 6 cfs to Chevron Oil Co., Energy Reserve Group, and Exxon Oil Corp. These companies are presently pumping underground water from a site (Chevron water well site) adjacent to the Green River for oil field operations.

Deseret proposes to replace Chevron's water well system with a large scale Ranney (collector well) method of water extraction and to supply the oil companies with their present and future water requirement (estimated at 4-6 cfs) from water taken by Deseret from the Green River.

[b]Water withdrawals are expected to be continuous, 365 days per year.

[c]Deseret's projections are to commence construction of unit 2 in 1990. These projections may change based on need and other factors. With the new Synfuels program it may be as early as 1986.

[d]Estimated useful life of unit 1 is 35 years. If the unit is operated for a longer period of time, the water requirements would continue until final shutdown.

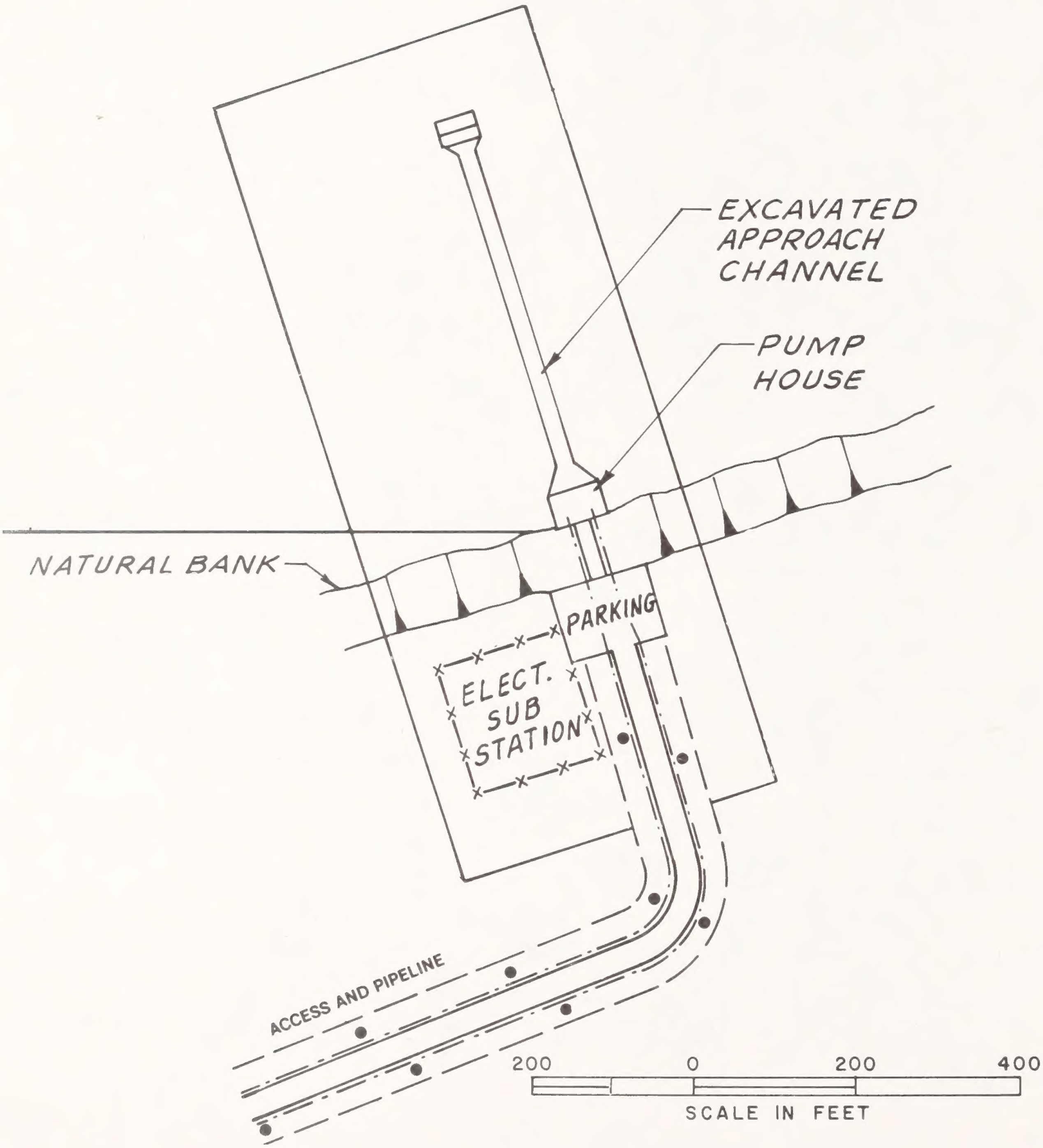


FIGURE 2-27

WATER INTAKE STRUCTURE

Presently an average of 500,000 acre-feet of water annually flows from the White River into the Green River (Bingham Engineering, 1979). Estimates of water availability for the Moon Lake project are dependent on assumptions of future development of existing conditional water rights and required water releases by the States of Utah and Colorado. (See the unresolved issues section of the Summary.)

Using Western Engineers, Inc. (1979a) assumptions on the development of existing water rights and a minimum streamflow of 95 cfs below the Utah White River Reservoir diversions, all of the Utah White River Reservoir's estimated project demands, except hydropower generation, would have been met had the project been in operation during 1977, the most severe drought year on record (Hansen, 1980a). The Utah Division of Water Resources indicated that hydropower generation would be curtailed during any serious drought to provide needed water for the Moon Lake project or other critical uses.

Use of Rangely Reservoir Project Water for the Rangely Site

The Water User's Association No. 1 of the CRWCD is proposing the Rangely Reservoir project. This project involves construction of a reservoir on the White River either at the Taylor Draw site about 7 miles east of Rangely (figures 2-3 and 2-28) or at the Wolf Creek site 18 miles northeast of Rangely (see figure 2-29), or at both sites if the Taylor Draw Reservoir were built first.

Use of Taylor Draw Reservoir for the Rangely Site

A feasibility and preliminary engineering study of the Taylor Draw Reservoir project has been completed. In August 1980, a $13 million bond to finance construction of the reservoir was approved and applications for permits and use of public lands were subsequently filed with the U.S. Army Corps of Engineers and the BLM. Commitments have been made for preparation of engineering plans (Hansen, 1980b). The impacts of construction and operation of this project will be studied in a separate report as required by the National Environmental Policy Act (NEPA). A preliminary environmental assessment has been prepared for Western Engineers, Inc. by Fleming (1979).

The Taylor Draw Reservoir would have a capacity of 13,800 acre-feet with an annual yield of about 41,462 acre-feet. According to Western Engineers, Inc. (1979), the minimum monthly yield during the drought period of 1977-78 would have been 1,770 acre-feet per month.

Sediment deposition would rapidly reduce the storage capacity of the Taylor Draw Reservoir. Western Engineers, Inc. (1979a) estimated that approximately 320 acre-feet of sediment per year would be deposited in the Taylor Draw Reservoir. Western Engineers, Inc. (1979a) used three flow ranges to make this prediction. Hansen (1980a) projected the annual sedimentation rate at 480 acre-feet based on a refinement of Western Engineers, Inc. method with 20 flow ranges. If it is assumed that an average yield between the two estimates is reasonable, the total sediment transported over a 30-year period would be 12,000 acre-feet. Of this amount, a significant portion would be deposited as a delta upstream from the reservoir. Some additional sediment would be flushed through the reservoir through low level outlet gates. During periods when sediment transport is greatest, the reservoir would be full, thus the delta formation would proceed primarily from the high water line.

Because of the manner of operation of the reservoir spillway and outlet works, the reservoir would never totally fill with silt, but over a period of

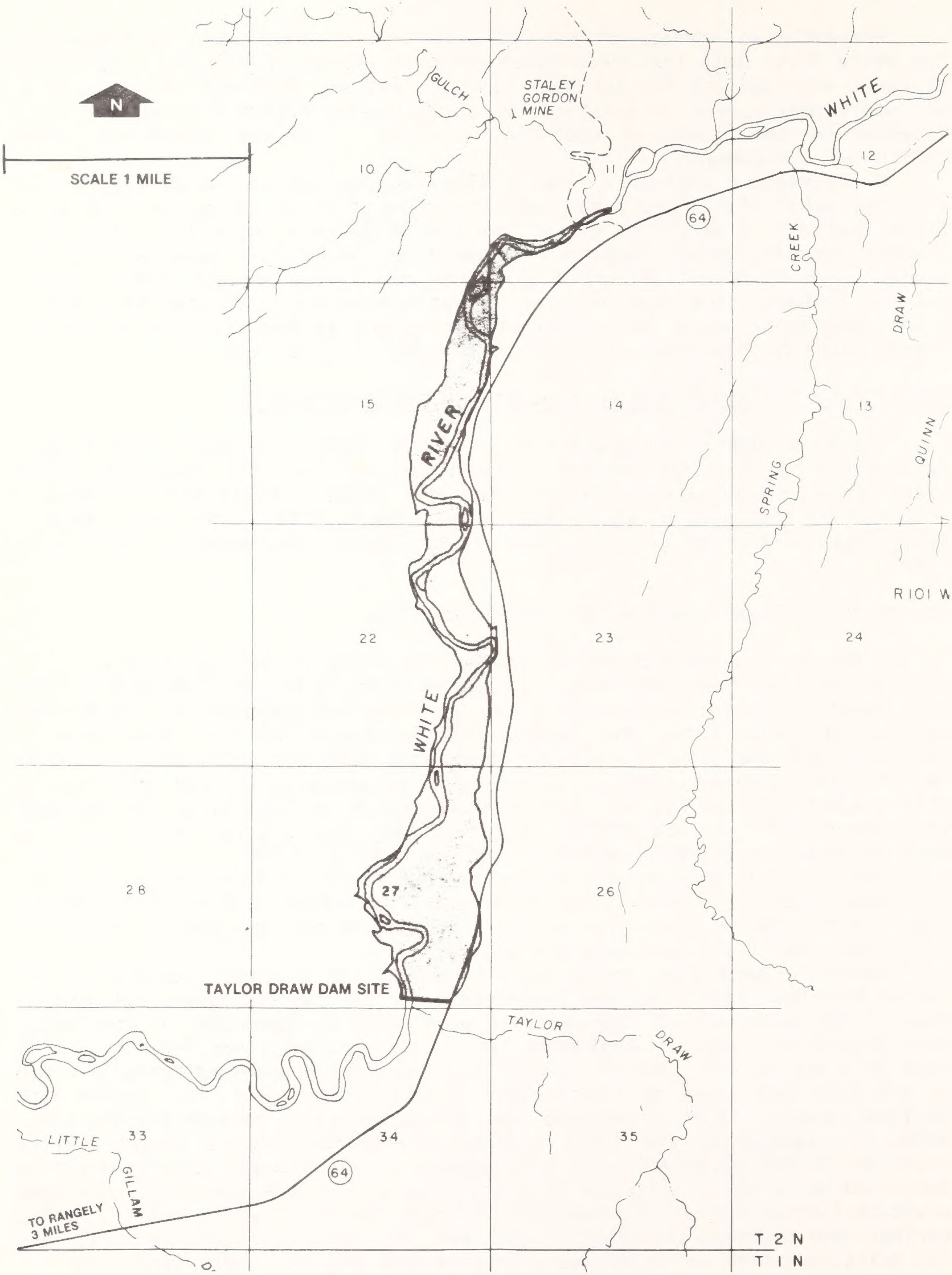


FIGURE 2-28

TAYLOR DRAW RESERVOIR

FIGURE 2-29

WOLF CREEK RESERVOIR

30 years, storage could be reduced to a range of 5,000 to 10,000 acre-feet if no additional storage facilities were constructed upstream. The reservoir could provide a water supply for a one-unit Moon Lake power plant. On a long-term basis, the Taylor Draw Reservoir could be used for a two-unit power plant as a holding pond for water that Deseret may be able to purchase from holders of existing conditional water rights on the White River.

Deseret holds a 6-cfs consumptive White River water right (Application No. W-297) with a priority date of 1947. The Town of Rangely in a letter dated June 4, 1980, has offered to sell up to 16 cfs to Deseret on an as-needed basis from Rangely's 30.95 cfs water right (Application No. W-3331). About 2.6 cfs of this water would have a priority date of 1947 and the remainder a priority date of 1957. The Rangely water right is a final adjudicated right of 30.95 cfs of which 3-4 cfs is being used by the town. Even with these early priority water rights, Deseret would be about 2,200 acre-feet short of their maximum water demand (17,470 for the generating station and 152.4 for mining operation) and could have to purchase additional water during low flow periods. Additional water may be available from the Yellow Jacket Water Conservancy District (YJWCD) or any other willing seller including holders of agricultural water rights. The priority date of the rights would be transferred with the sale.

The YJWCD in a June 2 letter to Rio Blanco County Commissioners states that the conservancy district is ready to take action to assure an adequate, reliable, and early priority water supply to Deseret (YJWCD, 1980). The terms of the agreement or the amount of water available have not been resolved.

In the upper White River basin, purchase of existing early priority agricultural water rights by oil shale or coal gasification companies has already occurred. Approximately 37,000 acre-feet of water is consumptively used on an average annual basis by irrigated agriculture in the upper White River basin (Colorado Dept. of Natural Resources, 1979). Since agricultural water rights are about one half consumptive, Deseret would have to purchase the right to divert water in amounts about twice their consumptive needs.

Water would be pumped from a standard intake structure at the eastern end of the Taylor Draw Reservoir and transported to the Rangely site via a 5-mile pipeline. The pipeline would parallel the Staley-Gordon Mine road for approximately 2 miles where it would then turn northeastward and follow the overland coal-conveyor corridor to the plant site.

Use of Wolf Creek Reservoir for the Rangely Site

A schedule has not been developed for the necessary permitting, financing, or construction of the Wolf Creek Reservoir. No applications have been filed. Water Users Association No. 1 has proposed to construct Taylor Draw Reservoir first, and then, when funds are available, to construct Wolf Creek Reservoir. If oil shale development accelerates or if water were needed for a large industrial user such as the Moon Lake project, financing might become available sooner than presently anticipated for a dam at the Wolf Creek site (Hansen, 1980a).

The Wolf Creek Reservoir would take about 1 year longer than the Taylor Draw Reservoir to construct. Preliminary engineering could be finished in about 9 months. The Wolf Creek Reservoir would have a 60,000 acre-foot storage capacity and an annual yield of 63,382 acre-feet. Storage in 1977, the driest year on record, would have produced about 4,500 acre-feet of additional water monthly beyond anticipated demands which would be three times the monthly Deseret requirement (Hansen, 1980a). The reservoir would also produce an

additional 6,000 acre-feet of water for irrigation. Because Wolf Creek would be a much larger reservoir than Taylor Draw, a larger annual carry-over of water would normally be available. Increased certainty of delivery would be present and available sediment storage space would be much more than at Taylor Draw. The location of the dam and high water line for the Wolf Creek Reservoir are shown in figure 2-29. Detailed data on the location of borrow material areas and design of the dam are not available. This alternative is presented on the assumption that, should the Rangely site with the Wolf Creek Reservoir water source be selected, additional design and environmental work would be required.

As with the Taylor Draw Reservoir, Deseret could add reliability to this water source by the purchase of additional early priority water rights from holders of conditional water rights on the White River.

GROUND WATER ALTERNATIVE

Bonanza Site

Because of poor quality and low volume, ground water at the Bonanza site is not considered as a viable alternative for use as condenser cooling water. The ground water situation near the Bonanza site is discussed in Chapter 3, Water Resources.

Rangely Site

The amount of ground water that could be physically recoverable in the White River drainage basin is unknown and, of that, only a fraction is apt to be economically recoverable (Colorado Dept. of Natural Resources, 1979).

The water quality of bedrock aquifers in the White River basin is generally poor and water would have to be processed for salt removal before being used at the generating station.

Discharge studies of 27 springs in the Piceance Creek (tributary to the White River) drainage basin indicate that about 80 percent of the average annual yield of that stream system comes from springs (Colorado Dept. of Natural Resources, 1979). Colorado law requires one who uses or disrupts a ground water system that is tributary to or discharges to a natural surface stream to ensure that the rights of senior surface water appropriations are not impaired. In this event, Deseret would still have to purchase high priority water rights in order to be assured of a reliable water source. Since this alternative would not solve the water rights problems of a surface water source and the ground water is of poor quality, the ground water source is not considered as a viable water source alternative for the Rangely site.

WORK FORCE PROJECTIONS FOR POWER PLANT AND RAW MATERIALS SUPPLY SYSTEMS

The employment figures presented here would apply to either the Bonanza or Rangely sites.

UNIT 1 SCENARIO INCLUDING THE DESERADO MINE AND RAILROAD COAL TRANSPORT ALTERNATIVE

Table 2-5 shows the anticipated distribution of the construction work force for unit 1 through commencement of its scheduled commercial operation.

TABLE 2-5

Peak Quarterly Employment: Unit 1, Deserado Mine, and Railroad

Year	Quarters	Plant		Mine and Railroad		Total
		Construction	Operation	Construction	Operation	
1981	1	50	2	--	--	52
	2	100	2	30	5	137
	3	100	2	135	16	253
	4	225	2	150	19	396
1982	1	225	2	150	23	400
	2	225	2	335	29	591
	3	300	6	260	130	696
	4	350	7	200	136	693
1983	1	450	23	150	168	791
	2	550	25	100	172	847
	3	633	56	--	174	863
	4	633	61	--	190	884
1984	1	750	61	--	192	1,003
	2	750	83	--	202	1,035
	3	633	120	--	203	956
	4	300	120	--	271	691
1985	1	75	120	--	275	470
	2	--	120	--	354	474
	3	--	120	--	354	474
	4	--	120	--	354	474

The total project peak workers for unit 1, including mine, plant, and railroad, would be approximately 1,035 in 1984.

UNITS 1 AND 2 SCENARIO INCLUDING THE DESERADO MINE AND RAILROAD COAL TRANSPORT ALTERNATIVE

This section describes the required work force if construction of unit 2 were to start 18 months after initiation of unit 1. Table 2-6 shows the projected construction and operational work force for both units by quarter. The peak construction force for the two units, mine, and railroad would be 1,613 and would occur in the fourth quarter of 1985. This would be the maximum number of employees required during development of the project.

DESCRIPTION OF TRANSMISSION SYSTEM ALTERNATIVES

INTRODUCTION

The transmission system for unit 1 of the Moon Lake project would be comprised of one 345-kV and three 138-kV lines. Unit 2 would require an additional 345-kV line.

As proposed by Deseret, the lines associated with the first 400-MW unit would transmit power from the plant site to substations in western Colorado, northeastern Utah, and central Utah. The line associated with the second 400-MW unit transmission system, based on projections of future power demands, would deliver power to a substation in northwestern Utah. The actual terminus for the unit 2 transmission system could change, depending upon the power needs at the time of unit 2 construction.

Structures for the 138-kV transmission lines would be wooden H-frames. Typical structures are shown in figure 2-30. It is expected that the distance between structures would be about 800 feet. The structures would support two overhead shield wires and three conductors.

The 345-kV structures would be self-supporting lattice-steel towers or wooden H-frames. Typical steel structures are shown in figure 2-30. The average distance between towers would be about 1,200 feet. The steel towers would support two overhead shield wires and three conductors.

Access roads would consist of a 16-foot-wide road that would follow within the proposed corridor.

The average acreage requirement per mile of line is given in table 2-7.

ROUTING ALTERNATIVES

Several alternative corridors have been studied in detail during development of the Draft EIS. Many were dropped from consideration because they presented no environmental advantages over the applicant-proposed or other routes or had obvious unacceptable impacts.

The routes discussed in this Draft EIS are shown in the pocket map at the back of the book. Appendix 5 table A identifies the individual segments that have been organized into the alternatives presented in Appendix 5 tables B through H. (These segments correlate with the pocket map.)

TABLE 2-6

Peak Quarterly Employment: Units 1 and 2, Deserado Mine, and Railroad

		Plant		Mine and Railroad		
Year	Quarters	Construction	Operation	Construction	Operation	Total
1981	1	50	2	--	--	52
	2	100	2	30	5	137
	3	100	2	135	16	253
	4	225	2	150	19	396
1982	1	225	2	150	23	400
	2	225	2	335	29	591
	3	350	6	260	130	746
	4	450	7	200	136	793
1983	1	550	23	150	168	891
	2	775	25	100	172	1,072
	3	858	56	--	174	1,088
	4	858	61	--	190	1,109
1984	1	1,050	66	--	192	1,308
	2	1,100	89	--	202	1,391
	3	1,083	138	--	203	1,424
	4	850	140	20	314	1,324
1985	1	708	165	50	318	1,241
	2	633	169	75	446	1,323
	3	750	169	100	446	1,465
	4	750	186	175	502	1,613
1986	1	633	200	100	513	1,446
	2	300	200	50	586	1,136
	3	75	200	--	594	869
	4	--	200	--	594	794
1987	1	--	200	--	594	794
	2	--	200	--	594	794
	3	--	200	--	594	794

TABLE 2-7

Average Transmission Line Acreage Requirements

Line-Circuit	Right-of-Way (ROW) Width (ft.)	Acres Disturbed Per Mile	Acres Occupied Per Mile
345-kV single	150	18.2	0.100
138-kV single	100	12.12	0.003
138- 345-kV double	170	20.6	0.110
Access Roads			
30 foot ROW 16 foot surface		(within line ROW disturbance)	1.90

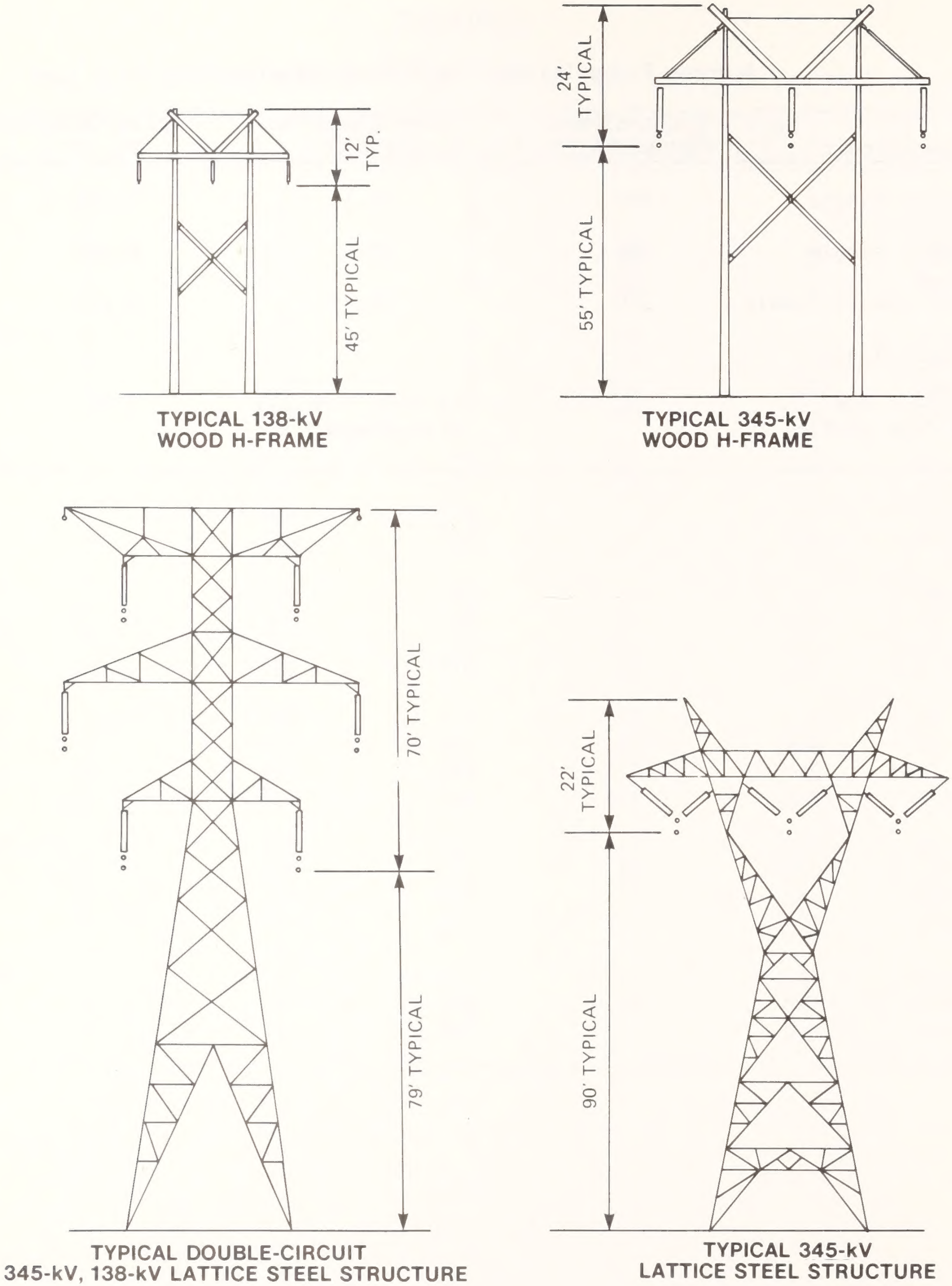


FIGURE 2-30

TYPICAL TOWER SKETCHES

BONANZA SITE

Unit 1 Transmission System Route Alternatives

Combined 345- and 138-kV Lines

The alternatives are divided into two sections (Bonanza to Tank Hollow and Tank Hollow to Mona substation) to avoid unnecessary duplication in the description and analysis of the routes.

Four alternatives to reach Tank Hollow from the Bonanza site are identified for the unit 1 345-kV line. The applicant-proposed and alternative corridors are shown in figure 2-31.

Upalco-Fruitland (Applicant-Proposed)

A route from the plant site to Tank Hollow via Stirrup Junction, Upalco substation, Sink Draw, and Fruitland.

Upalco-Sowers

A route from the plant site to Tank Hollow via Stirrup Junction, Upalco substation, Sowers Canyon, and Spanish Fork Canyon.

Castle Peak-Sowers

A route from the plant site to Tank Hollow via Castle Peak, Sowers Canyon, and Spanish Fork Canyon.

Castle Peak-Fruitland

A route from the plant site to Tank Hollow via Castle Peak, Bridgeland, Sink Draw, and Fruitland.

The unit 1 138-kV line from the Bonanza site to the Upalco substation would be placed on the same towers as the unit 1 345-kV line to Tank Hollow. Its route is, therefore, dependent on the route selected for the unit 1 345-kV line. The unit 1 line to Upalco could be constructed as a double circuit 345-kV line with one circuit energized at 138-kV and the other at 345-kV.

Three alternatives from Tank Hollow to the Mona substation are identified for the unit 1 345-kV line. Figure 2-31 illustrates the applicant-proposed and alternative corridors.

Dairy Fork (Applicant-Proposed)

A route to Mona via Dairy Fork and Water Hollow.

Thistle Canyon

A route to Mona via Thistle Canyon and Water Hollow.

Utah Valley

A route to Mona via Spanish Fork Canyon and Santaquin.

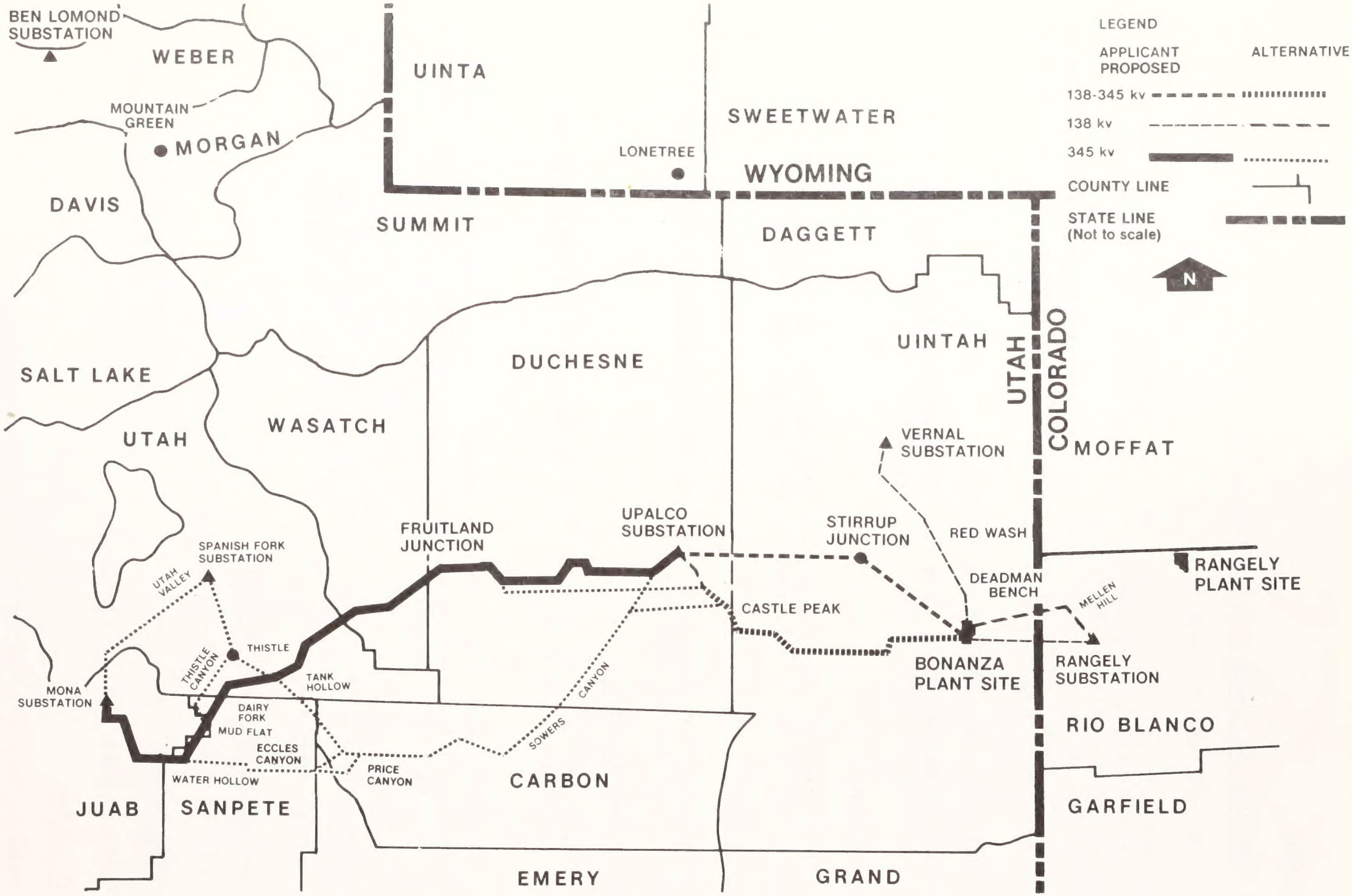


FIGURE 2-31

BONANZA PLANT SITE UNIT 1
TRANSMISSION SYSTEM ROUTES

The Eccles Canyon alternative (figure 2-31 is a route variation to the Upalco-Sowers and Castle Peak-Sowers alternatives and the Tank Hollow to Water Hollow portion of the Dairy Fork and Thistle Canyon alternatives. It leaves the Upalco-Sower/Castle Peak-Sowers alternative routes at Price Canyon, crosses the Manti-LaSal National Forest through Eccles Canyon, and meets the Tank Hollow to Mona (Dairy Fork and Thistle Canyon alternatives) route at Water Hollow. This route variation would replace a 25-mile portion of the Bonanza to Tank Hollow alternative via Sowers and Spanish Fork Canyons and a 30-mile portion of the Tank Hollow to Mona alternative via Dairy Fork or Thistle Canyon.

The lengths and acreage requirements of the alternative routes are listed in Appendix 5, tables B, D, and H.

138-kV Lines

Two 138-kV single circuit transmission lines, one to the Vernal substation and one to the southwest Rangely substation, would be required with unit 1. The applicant-proposed and alternative routes are shown in figure 2-31.

Unit 2 345-kV Transmission Line Routes

Four alternative routes for the unit 2 345-kV line from the Bonanza site to Ben Lomond substation are shown in figure 2-32.

Lone Tree (Applicant-Proposed)

A route from the plant site to Ben Lomond via Lone Tree, Wyoming. This northern route would be a single circuit 345-kV line.

Upalco-Fruitland

A western route from the plant site to Ben Lomond via Stirrup Junction, Upalco substation, Sink Draw, Fruitland, and Mountain Green.

Castle Peak-Fruitland

A western route from the plant site to Ben Lomond via Castle Peak, Bridgeland, Sinkdraw, Fruitland, and Mountain Green.

Wasatch Front

A route following any of the unit 1 routing alternatives to the Mona substation and then north along the Wasatch Front.

Should the unit 2 345-kV line be routed on one of the two alternatives to the west, it would follow the unit 1 345-kV line and would replace the 138-kV circuit on the double circuit towers up to the Upalco substation or Castle Peak Junction. The unit 1 138-kV line would be placed on its own set of towers parallel to the double circuit 345-kV line. If the unit 1 line were built as a double circuit 345-kV, the circuit originally energized as a 138-kV line would be energized as a 345-kV line, and a new 138-kV line would be built. The additional line would be required as only two circuits are generally placed on one set of towers.

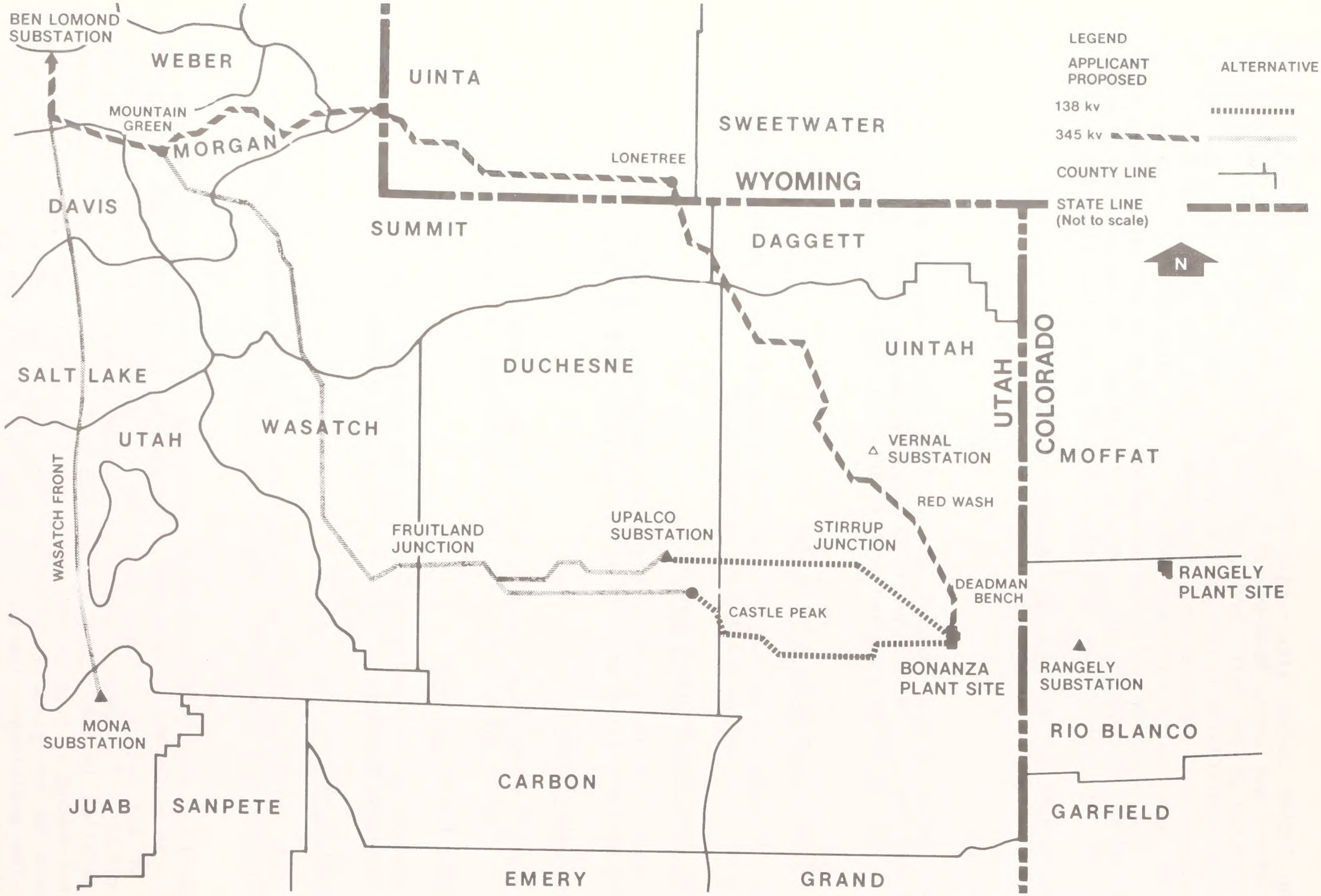


FIGURE 2-32

BONANZA PLANT SITE UNIT 2 TRANSMISSION SYSTEM ROUTES

RANGELY SITE

Unit 1 Transmission Line Routes

Combined 345- and 138-kV Lines

The alternatives to reach Tank Hollow from the Rangely site are the same as listed for the Bonanza site. A northern corridor from the Rangely site ties into the Upalco-Fruitland and Upalco-Sowers alternatives at Stirrup Junction; a southern corridor from the Rangely site ties into the Castle Peak-Sowers and Castle Peak-Fruitland alternatives at Coyote Wash.

The unit 1 138-kV line from the Rangely site to the Upalco substation would be placed on the same towers as the unit 1 345-kV line to the Mona substation. Its route is, therefore, dependent on the route selected for the unit 1 345-kV line. The unit 1 line to Upalco could be constructed as a double circuit 345-kV line with one circuit energized at 138-kV and the other at 345-kV.

The alternatives from Tank Hollow to the Mona substation would be the same as described for the Bonanza site unit 1 transmission system.

The applicant-proposed and alternative corridors are shown in figure 2-33. The lengths and acreage requirements of the routes are listed in Appendix 5, tables E through H.

138-kV Lines

Two 138-kV single circuit transmission lines, one to the Vernal substation and one to the southwest Rangely substation, would be required with unit 1. The alternative routes are shown in figure 2-33.

Unit 2 345-kV Line

Four alternative routes for the unit 2 345-kV line from the Rangely site to the Ben Lomond substation are shown in figure 2-34.

The alternatives to reach the Ben Lomond substation from the Rangely site are the same as listed for the Bonanza site. A northern corridor from the Rangely site ties into the Upalco-Fruitland and Upalco-Sowers alternatives at Stirrup Junction; a southern corridor from the Rangely site ties into the Castle Peak-Sowers and Castle Peak-Fruitland alternatives at Coyote Wash.

SYSTEM AND CORRIDOR COORDINATION ALTERNATIVES

UP&L INTERTIE, UNIT 1 345-kV LINE

This alternative would involve a wheeling (wholesale transportation of power by one company for another) contract and mutual transmission line construction agreement between Deseret and UP&L.

UP&L is planning to build a 345-kV single circuit line from the Hunter plant through Spanish Fork Canyon. The scheduled completion date for this line is 1983. Deseret could provide additional funding to UP&L or help construct double circuit towers for the Moon Lake unit 1 and Hunter 3 line along 24 miles of the line from Tucker (with the Sowers Canyon route) or 16 miles from Tank Hollow (with the Fruitland route) to the UP&L Spanish Fork substation (see figure 2-35). UP&L would then wheel power from the Spanish Fork substation to Deseret's customers west of the Wasatch Front.

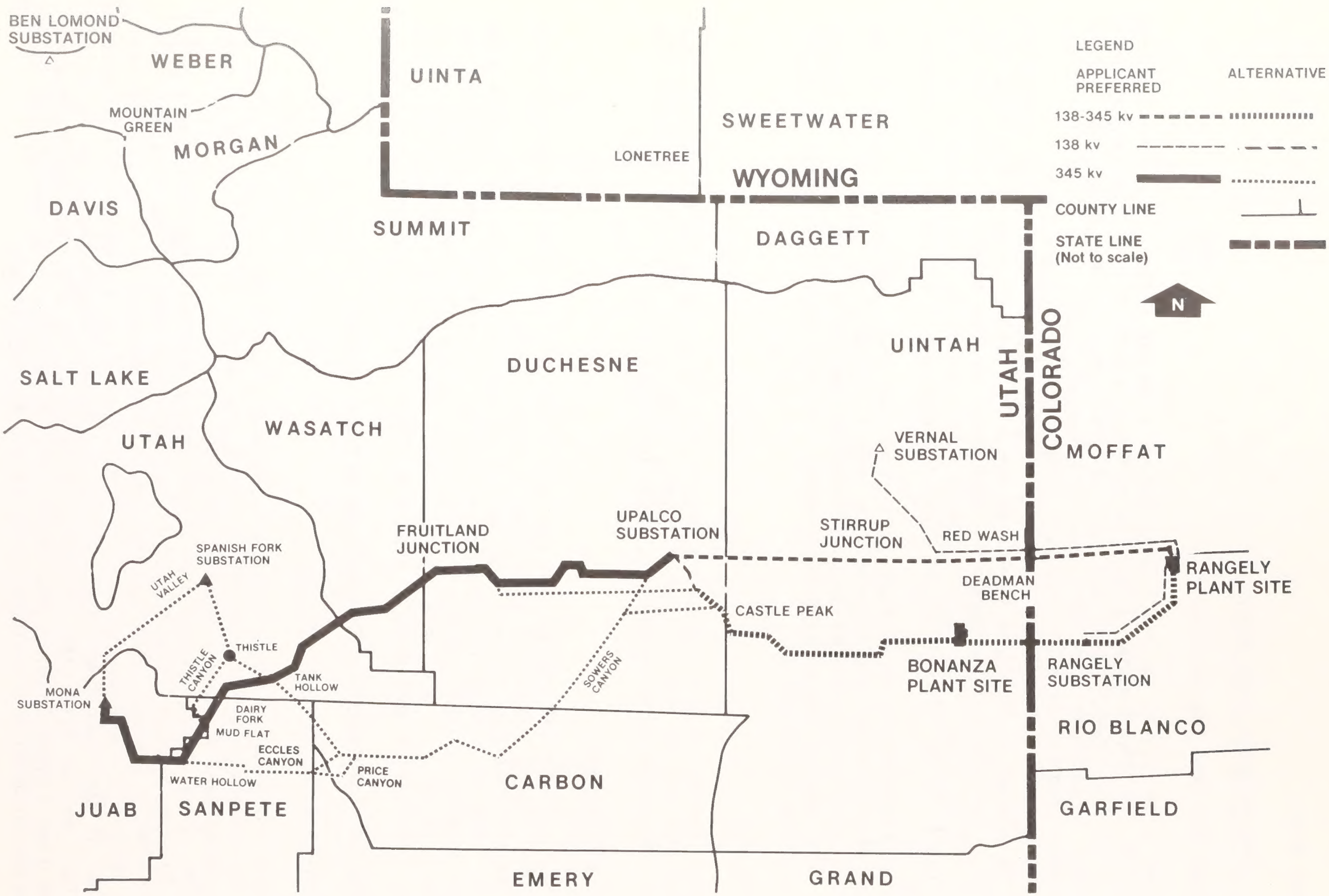


FIGURE 2-33

RANGELY PLANT SITE UNIT 1
TRANSMISSION SYSTEM ROUTES

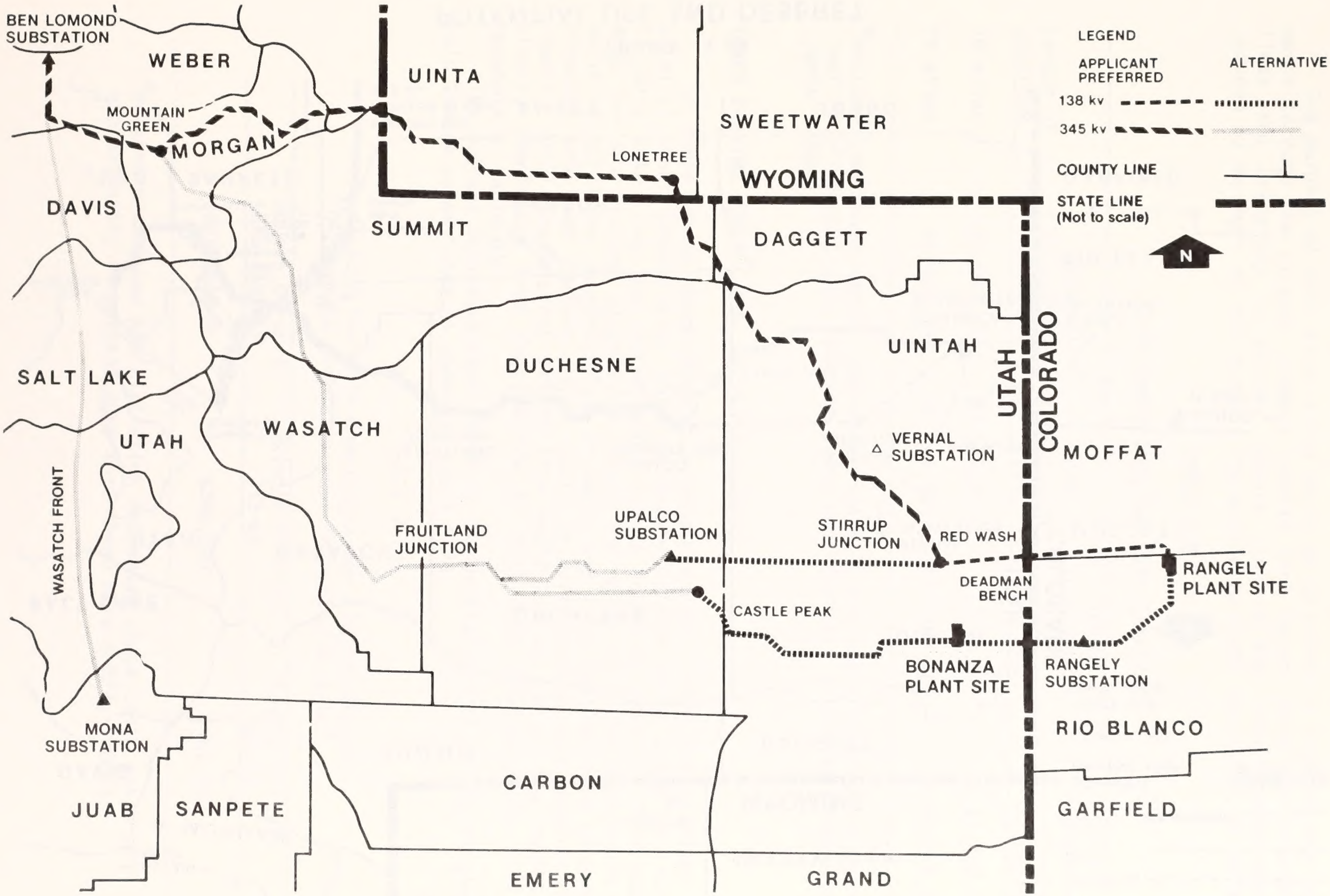


FIGURE 2-34

RANGELY PLANT SITE UNIT 2
TRANSMISSION SYSTEM ROUTES

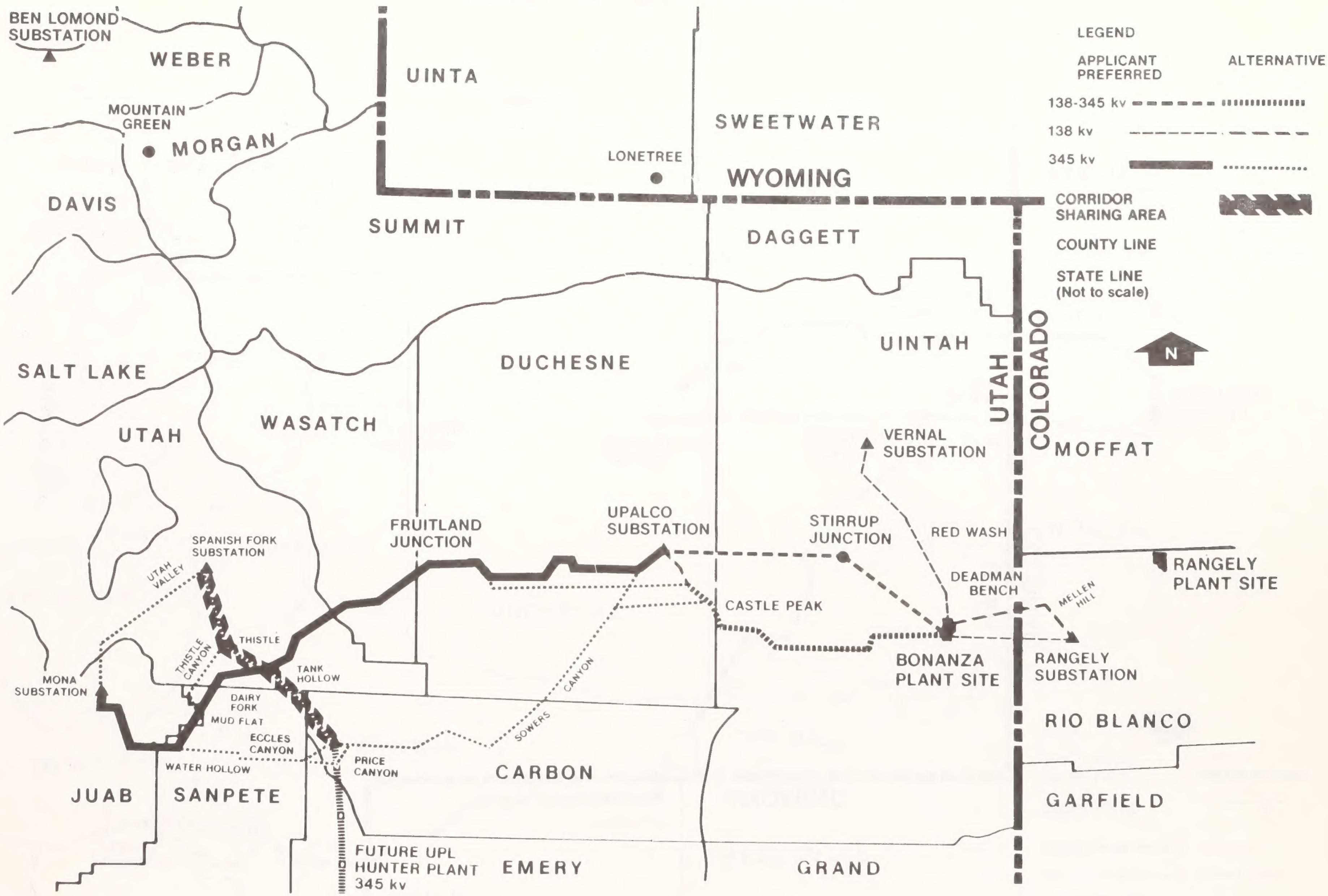


FIGURE 2-35
POTENTIAL UPL AND DESERET INTERTIE AND DOUBLE CIRCUIT AREA

The purpose of this alternative would be to minimize right-of-way requirements through the already crowded Spanish Fork Canyon where six transmission lines are presently in place. Future right-of-way requirements could be reduced by as much as 400 acres. The estimated costs are shown in table 2-8.

TABLE 2-8

Cost Comparison for UP&L Intertie[a]

Length of Intertie	Deseret Independent Cost	UP&L Independent Cost	Total Independent Cost Combined	Combined (System Alternative)
16 miles	$3,977,500	$3,680,800	$7,657,500	$6,256,108
24 miles	$5,966,400	$5,521,200	$11,487,400	$9,384,000

[a]Western Area Power Administration estimates these costs would be approximately 17-percent more than the Burns and McDonnell estimates shown here (WAPA, 1980b).

TOWER SHARING (UNIT 1 138- OR 345-kV LINES)

In those areas where Deseret's single circuit transmission lines would parallel other transmission lines, a double circuit tower could be installed to carry both lines and the original towers could be removed. This could be done for any routing alternative along the miles of lines that would be in existing corridors as indicated in table 2-9. In Spanish Fork Canyon, the proposed UP&L and Deseret lines could be incorporated onto double circuit towers, until the Deseret 345-kV line would follow any of the routes previously identified from Tank Hollow to Mona (see figures 2-31, 2-33, and Appendix 5, table B).

The average estimated cost per mile for double circuit versus single circuit transmission lines is shown in table 2-10.

TABLE 2-10

Cost Per Mile Comparison for Single Circuit Versus Double Circuit Transmission Line[a]

Double Circuit 345- 138-kV	Single Circuit 345-kV	Double Circuit 345-kV
$274,500	$248,600	$461,000

[a]Western Area Power Administration estimates these costs would be approximately 17-percent more than shown here (WAPA, 1980b).

TABLE 2-9

Transmission System Segments With Potential[a] for Tower Sharing

Segment Number	From	To	Total Length (mi.)	Potential Transmission Lines From Moon Lake Project	Miles Parallel to Transmission Line	Number, Ownership, and Size of Transmission Line
2	Little Bonanza	Rangely substation	17.5	1-138 kV (Bonanza site). 1-double circuit 138- 345-kV (Rangely site).	17.5	1, MLEA, 69-kV.
4	Mellon Hill	Rangely substation	9.7	1-138-kV (Bonanza site).	8.0	1, MLEA, 69-kV. 1, Water and Power Resources Service, 138-kV.
8	Upalco	Arcadia	4.0	2-345-kV (either plant site, units 1 and 2).	4.0	1, MLEA, 138-kV. 2, UP&L, 138-kV.
9	Arcadia	Sinkdraw	22.5	2-345-kV (either plant site, units 1 and 2). (Either plant site units 1 and 2).	12.0 10.5	1, MLEA, 138-kV. 1, UP&L, 138-kV. 1 MLEA, 69-kV. 1, UP&L, 138-kV.
10	Sinkdraw	Fruitland	15.0	2-345-kV (Either plant site units 1 and 2.)	15.0	1, MLCA, 69-kV. 1, UP&L, 138-kV.
17	Arcadia	Sowers Canyon	12.5	2-345-kV (either plant site units 1 and 2).	12.5	1, UP&L, 138-kV.
19	Sowers Canyon	Tank Hollow	65.0	2-345-kV (either plant site, units 1 and 2).	30.0 8.0	1, UP&L, 138-kV. 2, UP&L, 345-kV[b]. 2, UP&L, 138-kV. 1, UP&L, 44-kV.
20	Tank Hollow	Thistle	8.2	2-345-kV (either plant site, units 1 and 2).	8.2	1, UP&L, 44-kV. 2, UP&L, 138-kV. 2, UP&L, 345-kV[b].
21	Thistle	Spanish Fork substation	7.5	2-345-kV (either plant site, units 1 and 2).	7.5	1, UP&L, 44-kV. 2, UP&L, 138-kV. 2, UP&L, 345-kV.
24	Mud Flat	Mona substation	25.8	2-345-kV (either plant site, units 1 and 2).	19.7	1, UP&L, 44-kV. 1, UP&L, 138-kV. 1, UP&L, 345-kV. 1, UP&L, 500-kV[c].
26	Rangely site	Red Wash	41.0	1 double circuit 345-kV. 2-138-kV.	25.0	1, Water and Power Resources Service, 138-kV.
28	Rangely site	Rangely substation	15.5	1 double circuit 345-kV. 2-138-kV.	14.0	1, MLEA, 138-kV.
30	Fruitland	Mountain Green	92.9	1-345-kV (either site, unit 2).	15.0 10.0	1, MLEA, 69-kV. 1, UP&L, 138-kV. 1, UP&L, 230-kV.
31	Mountain Green	Ben Lomond	24.0	(1-345-kV either site, unit 2.)	13.0 11.0	2, UP&L, 230-kV. 3, UP&L, 138-kV. 1, UP&L, 230-kV. 1, UP&L, 345-kV.
32	Deadman Bench	Red Wash	8.0	1-345-kV (Bonanza site, unit 2). 1-138-kV (Bonanza site, unit 1).	8.0	1, MLEA, 69-kV.
33	Red Wash	Asphalt Ridge	9.0	1-345-kV (either site, unit 2). 1-138-kV (either site, unit 1).	9.0	1, MLEA, 69-kV.
34	Asphalt Ridge	Vernal substation	4.3	1-138-kV (either site, unit 1).	4.3	1, MLEA, 69-kV.
35	Asphalt Ridge	Mountain Green (via Lone Tree).	160.7	1-345-kV (either site, unit 2).	13.0	1, UP&L, 230-kV.
36	Mona	Ben Lomond	113.7	1-345-kV (either site, unit 2).	113.7	1, UP&L, 345-kV. 2, UP&L, 230-kV. 1, UP&L, 138-kV.

[a]Potential for tower sharing exists wherever a proposed transmission segment parallels an existing transmission line.

[b]1-345-kV line planned for 1984.

[c]1-500-kV line planned for 1987-88.

Appendix 6 provides information on transmission system reliability in relation to tower sharing and double circuiting.

UNITS 1 AND 2 345-kV LINE DOUBLE CIRCUITING TO THE SPANISH FORK SUBSTATION

This alternative would be construction of double circuit towers for the unit 1 345-kV line from either plant site via any of the alternative corridors to the UP&L Spanish Fork substation and wheeling of power by UP&L to Deseret's customers west of the Wasatch Front. The unit 2 345-kV line would then be placed on the same towers as the unit 1 line and UP&L would again wheel power for Deseret. A 170-foot-wide right-of-way would be required for the double circuit 345-kV line, rather than two 150-foot-wide rights-of-way for two separate 345-kV lines.

UNITS 1 AND 2 345-kV LINE DOUBLE CIRCUITING TO THE MONA SUBSTATION

This alternative would be construction of double circuit towers for the unit 1 line from either plant site via any of the alternative corridors to the Mona substation. The unit 2 line would then be placed on the unit 1 double circuit towers to Mona. Two options could then be taken. UP&L could wheel for Deseret from the Mona substation or Deseret's unit 2 line could then be routed up the Wasatch Front to the Ben Lomond substation as shown in figure 2-33. Over the 35-year life of the project, wheeling could cost as much as $28,668,700 (1980 dollars). Construction of the 345-kV line from Mona to Ben Lomond would cost approximately $59,583,000.

UNITS 1 AND 2 345-kV SYSTEM: UP&L-DESERET COOPERATIVE WHEELING

UP&L has identified the potential need for two 500-kV transmission lines from the Carbon-Emery County area to the Wasatch Front and points further north. One of the 500-kV lines would parallel an existing 345-kV line across the Manti Top or cross through Eccles Canyon south of Scofield Reservoir to reach the Wasatch Front near Mona, Utah. The projected time of construction is 1986 or 1988. A second UP&L 500-kV line projected for 1999 would be routed north along a corridor that runs east of the Wasatch Front to a point east of Logan, Utah. In order to avoid the need for an independent 345-kV line for the Hunter plant, two 345-kV lines for the Moon Lake plant, and at least one future 500-kV transmission line for UP&L operation, Deseret and UP&L could cooperatively construct a double circuit 500-kV line through Spanish Fork Canyon with capacity to handle the projected load of the four lines identified above. Construction of such a double circuit 500-kV line would cost about $589,200 per mile as opposed to an independent construction cost of $1,379,200 per mile for independent construction of the three 345-kV single circuit lines and each of the two single circuit 500-kV lines. Substations to convert voltages would increase the estimated costs of the 500-kV system.

JOINT AGREEMENT VIABILITY AND SYSTEM RELIABILITY

Although economic and environmental benefits can be gained from joint agreements such as system interties, tower sharing, and cooperative wheeling, the time frame for the development of such agreements is speculative and may not meet the required time frame for the Moon Lake project. The double-circuiting of a utility's major EHV transmission lines on the same towers also result in economic and environmental benefits. However, serious reliability

problems can occur in the event of a forced outage. The Reliability constraints of this alternative are discussed in Appendix 6.

UNIT 1 AND 2 345-kV CORRIDOR SHARING BY DESERET AND THE ROCKY MOUNTAIN PIPELINE PROJECT

Four companies, Pacific Gas Transport, Northwest Pipeline Co., El Paso Gas, and Pacific Interstate Transmission Co., are proposing to build a 40-inch diameter buried natural gas pipeline from Kemmerer, Wyoming to southern California. An EIS on this project is being prepared by BLM and is scheduled for completion in April 1981 with construction to begin in the summer of 1982. The proposed route for the pipeline would pass a few miles west of Strawberry Reservoir and would parallel Deseret's proposed transmission line from Strawberry Ridge to Nephi, Utah (figure 2-36). Two of the Moon Lake project unit 1 345-kV line alternative routes are in common corridors with the Rocky Mountain pipeline alternative routes. The Bonanza to Tank Hollow route via Upalco would be in the same corridor as the Rocky Mountain pipeline for about 10 miles (mileposts 20 to 30 of segment 11). The Tank Hollow to Mona alternative route via Dairy Fork would be in the same corridor as the Rocky Mountain pipeline for 36 miles (milepost 0 to 23 of segment 25 and milepost 0 to 13 of segment 24). This alternative would result in the impacts as discussed in Chapter 4 but would avoid the cumulative impacts of independent corridors for the two projects. During development of the Rocky Mountain Pipeline EIS, an alternative pipeline routing referred to as the Mill Ceek Route Variation was identified. It begins approximately 7 miles east of the Dairy Fork route, tying back into the Dairy Fork route at milepost 14. The variation could be used for corridor sharing beween the Rocky Mountain pipeline and Deseret's unit 1 345-kV line. Analysis of this corridor will be included in the Rocky Mountain Pipeline EIS scheduled for completion by BLM in July 1981.

EXCHANGE OF SERVICE AREAS AS AN ALTERNATIVE TO UNIT 2 345-kV TRANSMISSION LINE CONSTRUCTION

This alternative would consist of Deseret exchanging service areas with UP&L and the Water and Power Resources Service so that Deseret would service the Uinta Basin, and power from the Flaming Gorge hydroelectric plant could be routed on existing lines into Wyoming and back to Ben Lomond through UP&L's Naughton plant system. The Western Area Power Administration (WAPA) acts as a marketing agent for the transmission and marketing of federally generated power. At this time, an exchange of service area is not possible since the Uinta Basin presently uses about 100 MW of power and the Moon Lake project unit 2 would deliver about 400 MW of power. Because of this large difference in power demands, a new east-to-west transmission line would be required to deliver the power to the load centers. In any event, there is presently not enough line capacity in the Flaming Gorge system to deliver an additional 300 MW of power to the Wasatch Front (WAPA, 1980).

ALTERNATIVE FUEL SOURCES AND COMMERCIAL GENERATION TECHNOLOGIES

A steam-generating unit fired with Deserado Mine coal is only one of several power alternatives. Other fuel sources and commercial generation technologies are being developed such as :

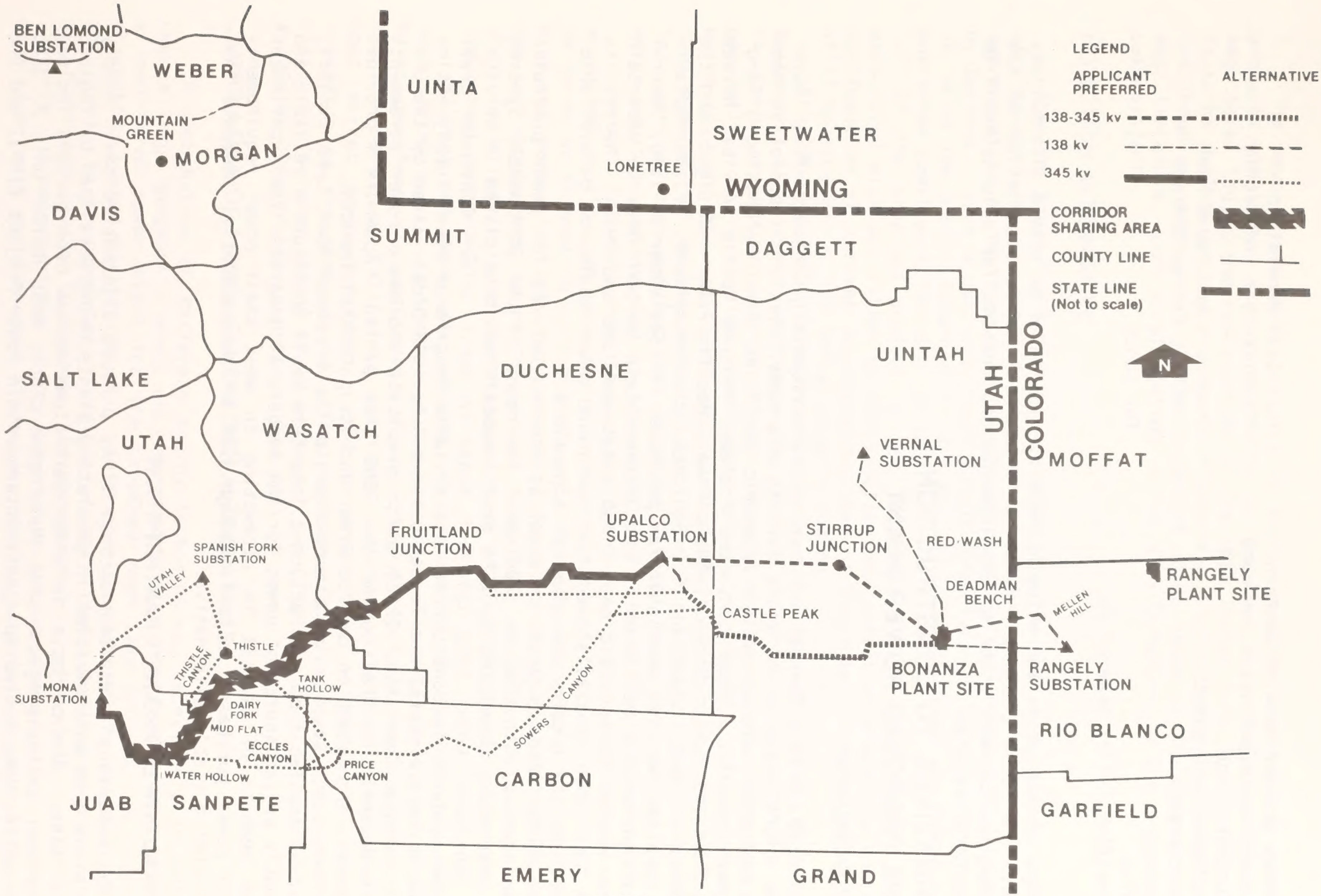


FIGURE 2-36

ROCKY MOUNTAIN PIPELINE CORRIDOR SHARING AREA

- Steam generation with Eastern coal, municipal waste, or wood
- Nuclear plant
- Hydroelectric plant
- Geothermal
- Solar
- Wind
- Gasifier Boiler Generation
- Fuel Cell Generation
- Fluidized Bed Combustion
- Solvent Refined Coal
- Coal-Derived Liquid Fuel
- Electric Energy Storage
- Oil Shale
- Tar Sands

None of the above technologies were considered to be viable alternatives for the Moon Lake project. Refer to Appendix 7 for a description of the technologies, current state of development, and reasons for elimination from further consideration.

ALTERNATIVES TO CONSTRUCTION OF THE PROPOSED POWER PLANT

POWER PURCHASE

In 1970, before Deseret was created, Intermountain Consumers Power Association (ICPA), acting as agent for its six rural electric cooperative members, contacted several Western electric utilities about purchasing a long-term power supply. Those contacted included Arizona Public Service, Nevada Power, Colorado Public Service, Idaho Power, Pacific Power and Light, and the Salt River Project. Each utility indicated that long-term, uninterruptable power supplies were not available for purchase. On September 8, 1980, Deseret again contacted all utilities in the Intermountain Western Area to ascertain whether surplus power would be available between 1985 and 1987. The results of the 1980 inquiry also showed that purchased power would not be available. Responses to the inquiry are given in Appendix 8.

In 1975, after 5 years of negotiations, a contract for power purchases was implemented with UP&L to supplement the needs of the ICPA member systems until generation developed by ICPA or its members could be placed in service. Power purchases under this contract began in April 1976. Continued power purchases under this contract are not a viable long-range power supply option for the Deseret members, one reason being a June 1979 Order issued by the Utah Public Service Commission (PSC) which prohibits wholesale power agreements between Deseret and UP&L beyond the 1985 time period. Appendix 4 provides additional information on the PSC Order and its potential impacts.

Power purchases, as an alternative to the proposed Moon Lake project, need to be available by contract on a long-term basis to ensure a reliable and reasonably priced source of power for the members of Deseret. The experiences of the members of Deseret in attempting to meet their power requirements through power purchases, either through ICPA or independently, indicate that this is not a viable alternative.

REGIONAL POWER PROJECT PARTICIPATION

The members of Deseret, through ICPA, pursued alternative power supply projects such as participation in generating plants being developed by regional utilities. The projects in which participation has been pursued include Allen-Warner Valley project, UP&L Huntington plant, UP&L Hunter Unit 2, UP&L future units, UP&L nuclear project, Intermountain Power Project (IPP), and the Yampa project.

The power from these projects is either totally committed or cannot be produced within the time requirements of the Moon Lake project. Deseret has negotiated the purchase of 158 MW of the UP&L Hunter Unit 2, of which 100 MW is to be available for the members of Deseret. Participation in Hunter 2 will not, however, supply all of the projected power needs of the Deseret members and, therefore, such participation is not an alternative to the proposed Moon Lake project.

NO ACTION ALTERNATIVE

The "No Action" alternative would involve the denial by Federal agencies of rights-of-way and other appropriate permits necessary for the construction and operation of the Moon Lake project or cancellation of the proposed project by Deseret. Such a decision could result from Federal agencies finding that it is in the public interest to deny the use of public lands or refuse a loan guarantee commitment for this project.

If the proposed project is not implemented, the environmental impacts associated with activities of construction and operation would not occur. A continuation of current environmental and socioeconomic growth trends would still be expected in the Vernal-Rangely region.

The "No Action" alternative would, however, necessitate the development by Deseret of alternate methodologies to meet the short-term demand for energy in their respective service areas. Deseret would have to investigate the possibility of developing other power plants or alternative energy sources which they and REA have concluded, through their analysis, are needed to meet that demand. If demands were not met, revolving blackouts could occur (certain part of each service area would be without power for part of each day) which could be detrimental to the overall welfare of the customers affected.

Deseret has estimated that delay could result in an additional cost of about $30 million per year for the project due to inflation. This cost would be borne by Deseret owner/consumers. If Deseret were unable to complete its proposed generating unit for commercial operation by the March 1985 deadline, the cost to Deseret to purchase power from UP&L, assuming the power is available, could result in an immediate increase of 20 to 40 percent dependent upon the amount purchased.

Without the Moon Lake project, Deseret would be required to enter the spot market to satisfy their load requirements. The availability of spot open market purchases is questionable due to the power deficits in the general area and the demand by California utilities. Further, the cost associated with spot market power purchases could be prohibitive to Deseret's consumers. Depending on the time of year, the purchase price for day-to-day power purchases could range from 5 to 10 cents per kwh (1980 dollars). This represents a 100- to 300-percent increase in the cost of power.

COMBINATION OF POWER GENERATION ALTERNATIVES

A combination of different energy technologies, necessarily distributed over a large geographic area, was not considered a practicable alternative to a coal-fired power plant for the proposed Moon Lake project. A dispersed generating system consisting of a variety of technologies, some of which are not proven to be completely feasible at this time, would likely prove more difficult and costly to operate and manage than a central energy producing facility. A heterogeneous energy generating system with an associated transmission network would be more extensive, complex, and interconnected than that

proposed for the Moon Lake project; and as such would have increased efficiency losses and failures. The costs of such a system would be greater, both in capital and operating costs and in more subtle efficiency and availability penalty costs.

COGENERATION

Cogeneration refers to the production in a single plant of electricity for a utility and process steam or heat for industry. It involves recovery and utilization of waste heat which would have been rejected to the environment if the electricity and steam had been produced in separate facilities. Cogeneration may promise greater economy than use of separate facilities and may result in energy conservation.

The types of industries presently in the vicinity of the plant site are not compatible with cogeneration.

ENERGY CONSERVATION

The National Academy of Sciences states that to reduce or limit the demand for electricity, energy conservation deserves the highest priority in energy planning. Common means of attaining energy conservation are:

Residential
- New standards for building construction
- Efficiency standards for appliances
- Swimming pool, water heater, air conditioning, and heating load management
- Installing additional insulation, storm windows, solar water heaters, or wood-burning stoves

Commercial
- New standards for building construction
- Utility audit programs
- Machinery/appliance efficiency standards
- Solar water heating and upgrading light systems

Industrial
- Installation of automatic turn-off devices on lights, heaters, coolers, compressors, etc.
- Reduction of electric motor horsepower requirements/replacement with more efficient motors
- Reduction of the number of days worked per week
- Maintenance of equipment at high efficiency levels
- New building construction standards
- Utility audit programs

Application of such measures in Deseret's service area is affected by the following factors:

About 80 percent of the demand for Deseret's electricity is for agricultural, commercial, and industrial use, including resource development such as oil-field production. It follows that electrical energy conservation promotion efforts should concentrate on this block of users.

The six member associations are dispersed over a wide geographic area with different local and state jurisdictions.

Present conservation efforts and incentives are largely voluntary. New construction is the principal activity regulated to promote energy conservation. Applicable energy conservation legislation and incentives are summarized in Appendix 9.

Through public education by utilities and consumer groups, legislated incentives and ordinances, and programs promoting industrial and commercial energy conservation, greater energy savings would be possible (ERI, 1975) than now exists or is projected in Deseret's load forecasts.

Consumer attitudes reflect a lack of sense of urgency regarding energy availability and shortages (Comptroller General, 1979). Therefore, participation in energy programs has developed slowly. Presently individuals are reluctant to incorporate electrical energy conservation into their lifestyles, especially where such measures are viewed as infringement of their personal freedom.

Rate increases by electric utilities in Utah are being attributed to new power plant construction costs. Decreasing demand through conservation could limit the need for new power plants. However, growth and development in the Deseret service area would be restricted by lack of available new electricity unless major geographic shifts in electric use were carried out on a regional, Western, or national basis.

In view of the above, and the complexity of dealing with the diverse needs and interests of electric consumers, an estimate of the energy conservation potential in the Deseret service area has not been quantified nor analyzed in further detail. Energy conservation is recognized as an issue of state and national importance. In keeping with the spirit of 1502.14(c) of the Council on Environmental Quality regulations, the concept is presented here as an alternative beyond the implementing jurisdiction of the Departments of Interior and Agriculture.

DESIGN ALTERNATIVES

Design alternatives include alternative cooling methods, flue gas desulfurization systems, particulate control systems, and solid waste disposal systems. A detailed discussion of these alternatives can be found in Appendix 10. Summaries of these discussions are presented below.

ALTERNATIVE COOLING METHODS

Five circulating water cooling systems were evaluated by Deseret and REA for use at the proposed Moon Lake project's generating station. These systems included: (1) wet evaporative cooling; (2) dry cooling; (3) wet/dry cooling; (4) once-through cooling; and (5) cooling ponds. Each of these systems were evaluated with respect to four criteria: (1) feasibility and engineering experience; (2) environmental effects; (3) economics; and (4) water consumption. A qualitative comparison of environmental, performance, and cost characteristics is given in table 2-11.

A wet evaporative cooling system, consisting of four, 8-cell, mechanical-draft cooling towers, was selected as the applicant-proposed cooling system for the two-unit generating station. This system was selected because of its reliability, favorable economics, and compatibility with site-layout design. The wet evaporative system's disadvantages are primarily its large

TABLE 2-11

Qualitative Comparison of Environmental Performance and Cost Characteristics of Alternative Cooling Systems

Characteristic	Mechanical Draft Wet Tower (Proposed)[a]	Natural Draft Wet Tower	Mechanical Draft Dry Tower	Mechanical Draft Wet-Dry Tower	Once-Through	Cooling Lake	Spray Pond
Vapor plume rise	Base	Higher	None	Less	None	None	None
Vapor plume extent	Base	Longer	None	Less	None	None	None
Ground fog potential	Base	Lower	None	Less	Near surface	Limited	Limited
Drift	Base	Equal but minor	None	Less but minor	None	None	Lower
Structural aesthetics	Base	Higher, seen at distances	Higher, with limited local viewing	Higher, with limited local viewing	None	Lower	Lower
Water consumption	Base	Generally equal	None	Reduced	Less	More	More
Water use	Base	Generally equal	None	Reduced	Much higher	More	More
Water discharges							
quantity	Base	Approximately equal	None	Reduced	Much higher	More	More
quality	Base	Generally equal	None	Generally equal	Much higher	Better	Better
thermal	Base	Generally equal	None	Lower	Much higher	Much higher	Higher
Land use	Base	Similar	Low	Similar	Lower	Extensive	High
Energy efficiency	Base	Slightly higher	Lower	Slightly lower	Much higher	Much higher	Higher
costs							
capital	Base	Higher	Higher	Higher	Lower	Usually higher	Usually higher
operating	Base	Lower	Higher	Higher	Lower	Higher	Higher

[a]Other alternatives are weighed relative to the proposed mechanical draft wet tower.

water consumption and its effect on the local atmosphere caused by vapor plume release. However, these disadvantages were not considered of sufficient magnitude to outweigh the advantages of the wet evaporative system or the disadvantages of the other alternative systems evaluated.

Dry and wet/dry cooling may have merit for water conservation in the arid West. An economic analysis, which estimated the capital costs of wet evaporative, dry, and wet/dry cooling systems showed that the wet evaporative system would cost approximately $9.24 million. In comparison, the dry cooling system would cost an estimated $27 million and the wet/dry system could cost an estimated $30 million. The dry and wet/dry cooling systems may result in lower steam cycle efficiency and increased consumption of fuel.

A detailed description of alternative cooling systems and their relative advantages and disadvantages is presented in Appendix 10.

EMISSION CONTROL, FLUE GAS DESULFURIZATION (FGD)SYSTEMS

Available processes for removing SO_2 from the flue gas of coal-fired boilers are based on absorption of the gaseous SO_2 into a solution. Most processes can meet the removal efficiencies required by air quality regulations. The processes differ in the type of additives used to remove the SO_2, whether the additives can be recovered (regenerative) or whether they remain with the sulfurous waste (nonregenerative), disposal impacts, and the complexity of operation. Also, since many systems have been developed in recent years, they have differing records of past performance.

Choosing one FGD system over another, therefore, includes decisions of: (1) what additives are available to Deseret and can be supplied throughout the life of the plant; (2) which types of waste products Deseret can dispose of and what available markets exist for the byproducts of the regenerative systems; (3) what maintenance problems can be managed by Deseret without jeopardizing the power needs of their members; and (4) what proven system reliability Deseret requires. These concerns were used in determining the preferred FGD system.

Deseret and REA considered nine different FGD systems. Table 2-12 lists the systems and compares the advantages and disadvantages of each. Because of Deseret's power and reliability requirements, it was decided that the system would have to be fairly simple and should have been shown to operate efficiently on large coal-fired units. These requirements eliminated several systems and left nonregenerative lime/limestone and nonregenerative double alkali as possible candidate systems.

Each system generates large amounts of waste which require disposal. The lime/limestone systems are more corrosive than the double alkali system and have more problems with plugging. However, they are easier to use since only one additive is required, lessening transportation, storage, and handling requirements. Lime/limestone does not have the added problem of soluble salts in the slurry. Based on the above, it was decided that lime/limestone would be the most appropriate FGD for Deseret, providing good operating and disposal characteristics. Other advantages are that lime/limestone is the most economical system and is the system with the most utility operating experience.

PARTICULATE CONTROLS

Deseret and REA assessed several control systems to meet required emission standards for particulates. The major systems which were considered were

TABLE 2-12

Qualitative Environmental Comparison of Flue Gas Desulfurization Methods

Parameter/Method	Land Requirements	End Product	SO_2 Removal Efficiency	Advantages (Relative to Other Systems)	Disadvantages (Relative to Other Systems)
Limestone/Lime	Large for disposal of slurry	Waste slurry	89-95%	Simple system. Minimum amount of equipment. High operating experience. Low capital cost. Waste can be "fixed".	Slurry disposal. Pluggage and corrosion. High limestone usage.
Double-Alkali	Large for disposal of slurry	Waste slurry	80-95%	Simple system. Low pluggage and corrosion. Lower liquid-to-gas ratios.	Slurry disposal. Chemical handling system more complex. Low operating experience on units in excess of 100 MW. Soluble salts in waste slurry.
Wellman-Lord	Large for equipment	SO_2, H_2SO_4, Sulfur	85-95%	Sulfur recoverable. Relatively high SO_2 removal efficiency. Reduced waste disposal quantities.	System is complex. High cost. Availability of natural gas required. Uncertainty of market for by-products.
Dry Scrubbing Process	Large for disposal of dry product	Dry $CASO_4$ and $CaSO_3$	80-90% (depending on coal quality)	Simple system. Minimum amount of equipment. Easier waste handling. Lower water consumption. Has been demonstrated to some extent on low sulfur coal.	Operation not fully demonstrated for high sulfur coal-fired units. Compliance with NSPS for high sulfur coal is uncertain.
MgO	Large for equipment	$MgSO_3$, concentrated SO_2 gas, sulfur	85-95%	Sulfur recoverable. Relatively high SO_2 removal efficiency. Reduced waste disposal quantities.	System is complex. Operation not fully demonstrated on large coal-fired units. High cost. High energy requirements. Uncertainty of market for by-products.
Catalytic Oxidation	Relatively compact	SO_2, H_2SO_4, Sulfur	80-90%	Sulfur recoverable.	High cost. Catalyst replacement. High temperature operation. System is complex. Operation not fully demonstrated on large coal-fired units. Uncertainty of market for by-products.
Citrate	Large for equipment	Sulfur	80-90%	Sulfur recoverable.	Hydrogen sulfide handling. Use of natural gas. Operation not fully demonstrated on large coal-fired units. Uncertainty of market for by-products.
Dry Absorption	Relatively compact	Sulfur	80-90% (for low sulfur coal)	Does not require water. Sulfur recoverable.	High energy use. High cost. Operation not fully demonstrated on large coal-fired units. Uncertainty of market for by-products.
Catalytic Oxidation	Relatively compact	SO_2, H_2SO_4, Sulfur	80-90%	Sulfur recoverable.	High cost. Catalyst replacement. High temperature operation. System is complex. Operation not fully demonstrated on large coal-fired units. Uncertainty of market for by-products.

electrostatic precipitators, fabric filters (baghouses), and wet scrubbers. Based on the ash characteristics of the proposed coal, control costs, energy requirements, and equipment size, it was decided that the fabric baghouse would be the preferable control system. Cyclones were not considered because of their poor removal efficiencies for small (less than 10 microns) particles.

SOLID WASTE DISPOSAL-AIR QUALITY CONTROL SYSTEMS

The FGD system and the particulate control system would generate large amounts of solid wastes for disposal. The two options available are to store the fly ash separately or blend it with the FGD system wastes. With blending, two additional options, forced oxidation and fixation, are available to further stabilize the end product. Separate storage is preferred where a market exists for the sale of fly ash, whereas blending fly ash with FGD wastes produces a soil-like material which is easier to transport and produces a more stable landfill. Because there are no markets for the sale of fly ash available to Deseret, the blending and fixation of dewatered sludge is proposed. Bottom ash can also be stored separately or blended with fly ash and scrubber wastes.

The blending and fixation of dewatered sludge was considered to be the most favorable FGD water disposal technique. The dry "fixed" material is very stable, so the disposal site could be reclaimed for other uses. The waste material would have a low permeability, therefore, contamination of ground water or surface water would be unlikely.

STANDARD MEASURES

This section summarizes applicant-proposed and standard Federal agency measures which would minimize or eliminate adverse impacts to the human environment. These measures would be employed because of existing laws, court decisions, agency policy, or firm applicant commitment. Following each measure is a short evaluation of its effectiveness in reducing environmental impacts.

MEASURES PROPOSED BY APPLICANT

a. Coal dust would be controlled by covering conveyors and spraying the reserve coal storage piles with a surface crusting agent.

   Coal dust suppression would be nearly complete.

b. Action would be taken, as necessary, to suppress any fugitive dust resulting from construction, ash handling, transportation, and disposal. Ash hauled to the disposal site would be covered with top soil and the site revegetated, as the fill progressed, as determined by the appropriate Federal official.

   Fugitive dust suppression would be effective the majority of the time. The degree of effectiveness would vary with weather conditions and depend upon sophistication of suppression equipment and success of soil consolidation projects such as revegetation.

c. Material borrow areas would be restored to blend with adjacent terrain.

Topographically, this mitigation would be about 100-percent successful. However, there may be a long-term contrast in vegetation types.

d. Depending upon regulatory determination, the solid and liquid waste disposal areas would be lined with impermeable materials to protect all surface and ground water bodies from seepage. As presently planned, the recycle and evaporation pond linings would have a permeability of $1X10^{-6}$ cm/sec.

Ground water would be protected assuming the integrity of the impermeable layer was preserved.

e. Depending on regulatory determination, the sanitary treatment disposal area would be lined to prevent percolation to underlying soil formations.

Ground water would be protected assuming the integrity of the impermeable layer was preserved.

f. The carrying of firearms by employees while on the job or in company-owned vehicles, with the exception of security guards, would be prohibited.

This may reduce vandalism (e.g., shooting of signs and the opportunistic shooting of game and nongame animals).

g. Deseret would coordinate with all regional, county, and local officials in planning, scheduling, and implementing development and construction.

This would aid local governments in planning for project-related community impacts.

h. Appropriate road signs for public safety purposes would be provided during construction. Flagmen, barricades, and other safety measures would be provided to insure public safety.

These safety measures would help reduce the likelihood of traffic accidents.

i. Colors selected for structures would blend with the natural landscape as coordinated by the appropriate Federal Official.

This would be effective in reducing the contrast of obtrusive structures. Even with design to complement form, line, color, and texture of the surroundings (e.g., painting structures natural and complementary colors), contrast with the landscape would, in certain instances, be high because of the inherent characteristics of the structures.

j. Mine drainage equipment would be designed to dewater the mine and minimize safety hazards to workers or equipment. The applicant would comply with all State and Federal discharge requirements.

Water at the mine, seepage, inflow, and outflow could be effectively controlled.

k. The reclamation plan for the Deserado Mine consists of three phases. The first phase would be initiated on all areas involved in initial construction activities not expected to receive further disturbance. This reclamation would be part of the original construction work. The next phase, ongoing reclamation, would progress throughout the life of the mine. This would basically consist of reclaiming the refuse disposal area and maintaining field plots to aid in reclamation planning. The last phase, final reclamation, would include the removal of surface facilities and complete reclamation of disturbed areas. Reclamation activities would consist of grading the disturbed area to approximate original contours, stockpiling and replacment of topsoil, preparing seedbeds, seeding, fertilizing, mulching, and subsequent management.

Mine reclamation is expected to be successful insofar as erosion prevention and contour is concerned. The naturalness, original vegetation species, and age class composition would probably not be retrievable.

l. During the beginning of mine facility construction, sedimentation ponds would be constructed to control sediment in all areas of surface disturbance.

This should be greater than 75-percent successful in keeping sediment on site and preventing the sedimentation of drainages and the covering of vegetation.

m. Deseret would provide busing for workers from Vernal and Rangely to the plant site.

This should reduce traffic congestion, energy consumption, and accidents.

n. Deseret has identified several social and economic mitigating measures that they will or may support (see Appendix 11).

These measures are not sufficiently quantified or committed to alter the analysis of socioeconomic impacts.

o. Deseret would comply with all State highway permits for transporting heavy haul power plant components.

Stipulations of the permit system would be effective in reduced traffic hazards resulting from slower than normal traffic flow.

MEASURES REQUIRED OF THE APPLICANT BY FEDERAL AGENCIES

Authority for Federal requirements for this project is granted under the following acts:

- National Environmental Policy Act of 1969
- Eagle Protection Act of 1969
- Fish and Wildlife Coordination Act of 1958
- Organic Administration Act of 1897, as amended
- Reclamation Act of 1902
- Preservation of American Antiquities Act of 1906
- Wilderness Act of 1964
- National Historic Preservation Act of 1966, as amended
- Executive Order 11593 of 1971 (Protection and Enhancement of the Cultural Environment)
- Federal Land Policy and Management Act of 1976
- The Clean Air Act, as amended 1977
- The Federal Clean Water Act of 1977
- Endangered Species Act, as amended 1978
- Executive Order 12088--Federal Compliance with Pollution Control Standards
- Executive Order 11990--Protection of Wetlands
- Executive Order 11988--Floodplains Management
- National Wildlife Refuge Systems Administration Act of 1966
- Federal Air Regulations, Part 77
- Federal Aviation Act of 1958
- Occupational Safety and Health Act of 1970
- Surface Mining Control and Reclamation Act of 1977
- Federal Noxious Weed Act, 1974

These measures are general guidelines for mitigation and may be altered by the appropriate Federal official to meet site specific needs. Deseret will, when restoring or rehabilitating areas disturbed by the construction of the transmission lines, pipelines, and associated access roads across private lands, use the same reclamation measures as required by land managers of adjacent Federal lands or reclamation measures as requested or required by the private landowner (Deseret, 1980).

a. A construction operating plan or similar document would be prepared covering the construction of all project facilities. Under authority of Section 504 of FLPMA the applicant would be required to provide funding to the appropriate Federal agencies for the purpose of financing one or more specialists and their vehicles for administration of construction activities.

   This would assure that proper site specific mitigation would be carried out.

b. All existing improvements (e.g., fences, pipelines, etc.) along project-related linear facilities (pipelines, transmission lines, etc.) would be protected and damage due to construction would be repaired.

This should be effective in maintaining the present integrity of structures along rights-of-way.

c. All public land survey monuments, private property corners, and forest boundary monuments would be located, marked, and protected. In the event of destruction, they would be replaced.

This should be effective in maintaining the present integrity of structures along rights-of-way.

d. Clearing would be restricted as per requirement of the appropriate land management agency. A clearing plan would be developed to address site specific needs. Determination of a hazard on the right-of-way would be a joint responsibility of the applicant and the appropriate Federal official consistent with the National Electric Safety Code and State or other electric safety requirements.

This would be effective in reducing the amount of clearing and should reduce the adverse impacts of clearing. Electrical and other hazards along transmission lines would be eliminated by following established codes.

e. Removal and stockpiling of topsoil would be required at all construction sites unless otherwise directed by the appropriate Federal official. Along transmission lines, dozer, blade, or ripper-equipped tracked vehicles would not be allowed except for access road construction.

Preserving and/or replacing topsoil would aid in revegetation, reduce surface scaring, and thus reduce contrast. The topsoil could not, in all cases, be removed without mixing with subsurface soils. Depending upon the specific soil characteristics, this may reduce or enhance the productivity of the "topsoil" when it is replaced.

f. The BLM has determined that the proposed action may have an effect on an officially listed endangered species. Appendix 23 is the official USFWS biological opinion. BLM would not take any action which would jeopardize the continued existence of any threatened or endangered species. No operations would be permitted in any areas where bald or golden eagles and/or their nests would be molested during the nesting season.

This would be 100-percent effective in assuring compliance with the Endangered Species Act.

g. The applicant would provide funding for a botanist, approved by the appropriate Federal official, to survey for candidate, proposed, and officially listed threatened or endangered flora. The botanist would complete a 100-percent survey of all areas to be disturbed and designate those areas in which no disturbance would be permitted. The botanist would be available, as needed, during the construction period.

This would be effective in preventing damage to T&E plants and their habitats.

h. A transportation plan would be submitted by the applicant for review and approval by the appropriate land management agency. This plan would cover approval of temporary, reconstructed, and newly constructed roads and would include clearing work, rehabilitation, and use associated with transportation needs. Overland access could be specified in lieu of road construction or reconstruction.

This would be highly effective in assuring fewer environmental impacts associated with road construction activities.

i. Along linear facilities, rivers, streams, and washes would be crossed at existing roads or bridges, except at locations designated by the appropriate Federal official. The applicant would be required to install culverts or bridges at points where new permanent access roads would cross live streams to allow unobstructed fish passage. Where drainages would be crossed by temporary roads, dirt fills or culverts would be placed and removed upon completion of the project. Any construction activity in a perennial stream would be prohibited unless specifically allowed by the appropriate Federal official. All stream channels and washes would be returned to as near natural state as possible.

This would be effective in reducing the number of streams that would be crossed and limiting long-term adverse impacts. Short-term impacts would still occur but the magnitude would be less with this mitigation.

j. On areas which would be cleared of vegetation by construction or other activity associated with this project, vegetation would be reestablished under the direction of the appropriate Federal official using procedures appropriate to the impacted areas. Vegetation cleared during construction would be disposed of as per direction from the appropriate Federal official. Where commercial timber is cut, the trees would be measured and commercially sold or disposed.

Soil cover would be reestablished but composition would, in most cases, be modified and, in general, there would be long-term changes in the general aspect of the impacted vegetation.

k. Prior to initiation of the construction phase, the applicant shall secure the services of a landscape architect to prepare the design and mitigation requirements for the project to meet the assigned visual resource management class and contrast ratings requirements, as stated in BLM Manual Section 8423 and/or Forest Service Manual 2380.

This would be effective in reducing the contrast of obtrusive structures. Even with design to complement form, line, color, and texture of the surroundings (e.g., painting structures natural and complementary colors), contrast with the landscape would, in certain

instances, be high because of the inherent characteristics of the structures.

l. All trash, packing material, and other refuse would be removed from construction areas and salvaged or placed in approved sanitary landfills.

This would be effective in controlling construction associated refuse. There would probably be some debris blown off the site by wind.

m. Nonspecular (non-reflective) conductors and compatible insulators would be installed on all transmission line systems.

This would be effective in reducing visibility and reflectiveness of powerlines and insulators.

n. All access roads blocked as the result of construction of project components would be rerouted or rebuilt and cattleguards or gates would be provided along the new access roads as directed by the appropriate Federal official. All access road construction would be handled in response to and approval of a submitted transportation plan.

This would be effective in maintaining established access and preserving livestock management facilities.

o. Intensive archaeological surveys and clearances would be required for all project sites (as specified in BLM Manual 8111.14) prior to new construction. Properties eligible for inclusion in the National Register of Historic Places would be identified in consultation with the State Historic Preservation Officer (as specified in 36 CFR 800.4 and 36 CFR 63). Wherever possible, sites would be avoided. Where avoidance is not possible, mitigation of adverse effects to sites eligible for the National Register would be undertaken in compliance with 36 CFR 800. Sites discovered during construction or other activities authorized by the appropriate Federal official would be evaluated and managed as specified in 36 CFR 800. Memorandums of Understanding with the Utah and Wyoming State Historic Preservation Officers regarding protection of cultural resources have been signed. Consultation with the Colorado State Historic Preservation Officer has been initiated.

Regardless of measures taken, damage to cultural artifacts could still occur, especially to subsurface sites. However, the appropriate Federal official would apply consistent management practices at all construction sites for all archaeological and historical resources. Information would be conveyed to the State Historic Preservation Officer or other agencies as appropriate. Regulatory compliance would be assured.

p. The applicant would be required to provide for the control of noxious weeds as directed by the appropriate Federal official.

The probability of success of this mitigation would be commensurate with the techniques used.

q. The applicant would provide a qualified paleontologist who would be approved by the appropriate Federal official. The paleontologist would conduct an intensive survey of all areas to be disturbed which were identified as having high potential for significant paleontological resources. An approved paleontologist would be available, as needed, during surface disturbance. If the paleontologist determined that values would be disturbed, construction would be halted until appropriate action could be taken.

The paleontologist would be able to avert most damage to paleontological resources by recording scientifically important data. There would remain a high potential for inadvertant damage to subsurface fossils.

r. In cooperation with the appropriate Federal official, a fire control plan would be prepared. Internal combustion engines would be equipped with approved exhaust mufflers or spark arrestors.

The possibility of fires would not be eliminated, but identifing liability for such fires could tend to make the applicant more cautious and various resources would be better protected against loss due to fire.

s. Construction-related travel would be restricted to rights-of-way. Cross-country motor vehicle travel by construction and operation crews would be prohibited in closed or restricted areas.

This may reduce impacts to soil, vegetation, and wildlife by a small percentage, but because actual access would be increased, ORV impacts due to public use could increase.

t. All power transmission lines would be designed to prevent electrocution of raptors.

This would be 100-percent effective in preventing the death of raptors or other large birds due to electric shock.

u. Construction of facilities would not be allowed when in conflict with existing mining and drilling operations.

This would be effective in reducing conflicts between the project and existing interests.

v. Issuance of rights-of-way for project facilities would be subject to valid existing prior rights.

This would safeguard the rights of persons or companies whose mineral or other claims preceed those of Deseret.

w. No property acquired or developed with assistance under Section 6-F of the Land and Water Conservation Fund Act would, without the

approval of the Secretary of the Interior, be converted to other than public outdoor recreation uses. The Secretary would approve such conversion only if he found it to be in accord with the applicable comprehensive statewide outdoor recreation plan and only upon such conditions as he deemed necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

This would assure that the public would not lose Section 6-F lands or free access to them. Also, lands of equal recreational value would be acquired should any 6-F lands be disposed of due to project needs. The success of this mitigation would vary by circumstance because of the attitudes of the land users and/or owners involved.

x. The applicant would comply with grounding and clearance requirements of the National Electric Safety Code and appropriate REA bulletins.

This would be 100-percent effective in assuring standard clearance and proper grounding procedures were adhered to.

y. A mining plan for the Deserado Mine, as required by the USGS and OSM, would be prepared by the company, approved by the appropriate Federal official, and concurrence obtained from the surface managing agency before removal of any Federal coal. The company would be required to restore the lands affected to a condition capable of supporting the use which it was capable of supporting prior to any mining.

This would increase the likelihood that all safety and environmental factors would receive proper consideration before, during, and after mining operations.

z. Helicopters would be used to erect towers and string conductors in areas where access across the terrain or management constraints preclude standard construction methods or where designated by the appropriate Federal official.

Soil, vegetation, and aesthetics would be protected if this mitigation where used. Some disturbance would take place at the actual construction sites.

aa. Blasting and other surface disturbances would be prohibited within 500 feet of all live springs, reservoirs, or water wells.

The degree of effectiveness of this mitigation cannot be determined, as the size of explosive charge, geologic, topographic, and ground water character would not be identical from place to place. This mitigation could generally be expected to protect these water resources from blast-caused damages.

bb. Water which has been appropriated to Federal agencies or other users would not be used without the written authorization from the appropriate Federal official or water right owner.

This mitigation would be effective in assuring that proper water use and allocation procedures were followed.

cc. Areas subject to mudflows, landslides, mudslides, avalanches, rock falls, and other types of mass movement would be avoided in locating the linear facilities. Where such avoidance is not practical, the design, based upon detailed field investigations and analysis, would provide measures to prevent the occurrence of mass movements.

Taking these hazards into consideration during the design stage of any project would help prevent structure or resource damage.

dd. Blasting and all other surface disturbances would be prohibited within 500 feet of all dwellings, recreation trails, roads, highways, and recreation site improvements and developments, unless otherwise approved by the appropriate Federal official.

Under most circumstances, 500 feet would give an adequate safety margin to prevent structural damage for a blasting operation. The size of the charge and circumstances would vary with the specific situation.

ee. Deseret proposes to purchase a power generation site at Bonanza or at Rangely. Under the provisions of Section 203 of FLPMA, BLM could convey the public lands for the power plant site by direct sale to Deseret if found to be in the public interest. The sale price of the public lands would be at the fair market value determined by real estate appraisal. In accordance with Section 209 of the FLPMA, all mineral rights would be reserved to the United States. However, if it is concluded that the reservation of the mineral rights to the United States would interfere with or preclude appropriate nonmineral development of the land, and that such development would be more beneficial use of the land than mineral development, the United States could convey the mineral interests to the surface land owner. The conveyance of the mineral interest would be subject to valid existing rights such as oil and gas leases.

The rights of mineral or oil lease claimants would be protected. Land would be transferred from public to private surface ownership. The public would lose all right of access.

ff. The proposed Bonanza site lies within lands withdrawn as an oil shale reserve by Executive Order No. 5327. This Executive Order temporarily withdraws lands containing deposits of oil shale from lease or other disposal. The Bonanza site could not be sold unless this withdrawal were modified to permit such action.

An alternative to direct sale of public lands to Deseret would be the issuance of a right-of-way grant for a power generation site and auxiliary facilities. A right-of-way grant may be issued for the life of the project with a right of renewal. A right-of-way could also be granted for the plant site until the oil shale withdrawal was modified to permit sale of the land. This measure would ensure compliance with Executive Order No. 5327.

MEASURES REQUIRED OF THE APPLICANT BY STATE AND LOCAL ENTITIES

The same or additional mitigating measures could be required by State and local officials. Authority for this is granted in the State of Utah under the Utah Code Annotated (UCA) 1953, 63-2-1 and under similar laws for Colorado and Wyoming.

MONITORING AND DECOMMISSIONING

ENVIRONMENTAL MONITORING

Monitoring would be carried out as required by the appropriate State, local, or Federal regulatory agencies.

METEOROLOGICAL MONITORING

Deseret proposes to monitor meteorological conditions near the plant site as required by Federal or State authority. Wind speed and direction, humidity, temperature, and SO_2 and particulate levels would be measured. Precipitation and evaporation would also be recorded.

STACK EMISSION MONITORING

A flue gas monitoring system would continuously sample plant stack emissions. Monitoring instruments would record SO_2, nitrogen dioxide (NO_2), oxygen (O_2) concentrations, and opacity. Opacity measurements would aid in determining the visibility of stack emissions.

SURFACE WATER QUALITY MONITORING

Water quality for plant use would be monitored throughout the project's life. A surface water monitoring program would be conducted at two stations on the White River, one station in Scullion Gulch, and four stations at other locations around the Deserado Mine.

As required, water quality data collected from surface water monitoring stations would be submitted quarterly to the appropriate regulatory authority.

GROUND WATER MONITORING PROGRAM

An ongoing program of water level monitoring would be conducted at 18 wells surrounding the Deserado Mine. Measurements would be made quarterly (January, April, July, and October). This program would continue until mining ceased or until the data show that a change in measurement intensity is warranted.

Ground water quality samples from the area would be collected from within the mine on the previously outlined quarterly basis. Samples would be collected near the active face of the mine and at other points if perennial inflow is encountered.

Ground water monitoring in the vicinity of the power plant would also be required.

DECOMMISSIONING

The continued operation of any or all parts of the project at the end of its estimated 35-year life would depend upon the needs of the participants, the relationship to other available energy sources, environmental impacts, economics, and technical viability at that time.

As any or all of the project systems could reach a point where they would no longer serve a useful purpose for Deseret or other related projects, the facilities would be removed in accordance with the laws and regulations existing at that time.

At this time, disposition of the power transmission systems at the conclusion of the project cannot be determined with any certainty. With the exception of the tower footings, which would probably not be removed entirely, the transmission lines would be dismantled, if no longer in service, and the land returned to its previous condition. Tower footings would be removed to below ground surface.

COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2-13 at the end of this chapter provides a comparative analysis summary of the alternatives and summarizes the unavoidable adverse impacts, irreversible and irretrievable commitments of resources, and the affect of short-term use of the environment on its long-term productivity which would result should the Moon Lake project be implemented. The impacts mitigated in Chapter 4 have been subtracted from the total impacts described in that chapter and remaining adverse impacts are set forth here.

Irreversible commitment is defined as incapable of being reversed; once initiated, action would continue. Actions committing future generations to continue a similar course may be considered irreversible. Irretrievable is defined as irrecoverable; not retrievable; once used, not replaceable.

Activities involved with the Moon Lake project would derive short-term values from the environment which would affect its long-term productivity. The short term is the project's predicted life - 35 years. Long term is the period beyond the project's predicted life.

The table is organized so that a comparison of impacts can be made within system components. For example, the impacts expected from construction on the Bonanza plant site are compared to the impacts expected from construction on the Rangely site, and impacts expected from delivery of coal to each site are then compared.

THE AGENCY-PREFERRED ALTERNATIVE

The selection of preferred alternatives is based on environmental information in the Draft EIS, as well as other factors such as agency policies, applicant need, engineering and reliability, and views received to date from other agencies and the public. The agency-preferred alternative may be revised or further defined in the Final EIS as a result of comments received on this Draft EIS.

At this time the BLM and U.S. Forest Service (USFS) consider either plant site viable. The Rural Electrification Administration (REA) has a preferred alternative which is also presented.

Several issues are involved with the use of either site. The main issue for the Bonanza site is the impact and expense of transporting coal, while the main issue with the Rangely site concerns the proper timing for a firm water supply and whether a firm water supply would even be available.

Socioeconomic impacts would occur in both Rio Blanco and Uintah Counties. The development of the Rangely plant site would concentrate socioeconomic impacts in Rio Blanco County because both the power plant and coal mine would be there.

BUREAU OF LAND MANAGEMENT AND U.S. FOREST SERVICE

The BLM- and USFS would propose to grant a right-of-way and other land use authorization for a power plant project. The power plant would initially be comprised of one 400-MW unit but ultimately a second 400-MW unit would be added. Sufficient land for both units would be granted at the authorized plant site. At present, either the Bonanza site or the Rangely site would be acceptable to the BLM and USFS, subject to the application of appropriate mitigating measures presented in Chapters 2 and 4. The preferred raw material supply systems associated with each site are presented below.

BONANZA PLANT SITE

Preferred components of the Bonanza site are:

1. <u>Bonanza Site Water Source</u>

   Use of the Green River water with purchase of Flaming Gorge storage water by Deseret and appropriate releases by the Water and Power Resources Service to avoid jeopardy impacts to endangered fish species in the Green River. The water source for the coal mine would be the purchase of existing irrigation water rights from the White River, subject to Colorado State approval.

2. <u>Bonanza Site Water Transport System</u>

   An off-stream collection well system and pumping station near Walker Hollow and a 19-mile pipeline to the Bonanza plant site would be preferred. This is also Deseret's proposed system.

3. <u>Bonanza Site Coal Source and Transport System</u>

   The Deserado Mine with electric railroad coal transport is the agency-preferred alternative. The railroad alternative would have fewer environmental impacts than other alternatives and would have operational flexibility and reliability.

RANGELY PLANT SITE

Preferred components of the Rangely site are:

1. Rangely Site Water Source

Purchase of existing agricultural water rights from the White River for operation of unit 1 and the Deserado Coal Mine with options to purchase additional water for unit 2. This approach is consistent with an alternative described in the USFWS biological opinion and would avoid jeopardy to endangered fish. Depending upon the outcome of additional USFWS field studies of the White River in late 1981, the need for exercising the future unit 2 irrigation water options may be eliminated if the White River is found to be nonessential to endangered fishes. In that case, water appears to be available through use of an existing 6 cfs water right on the White River owned by Deseret and by use of a 16 cfs right on the White River offered to Deseret by the Town of Rangely for the Rangely plant site. Any adjustments in water rights or points of diversion would be subject to Colorado State approval. A reservoir or diversion structure on the river would be required. However, the completion date of the storage facility may not be within Deseret's required time frames.

2. Rangely Site Water Transport System

Use the Taylor Draw Reservoir (proposed by the Colorado River Water Conservancy District) as a holding pond and pump water via a 5-mile pipeline to the Rangely site. On-site limited water storage would be provided. Storage being planned by the CRWCD could provide for future delivery. Early priority water rights could be purchased from the Town of Rangely, the YJWCD, or any other willing seller of conditional water rights to assure a reliable source.

3. Rangely Site Coal Source and Transport System

The Deserado Mine with transportation of coal via a 4-mile conveyor is the agency-preferred alternative.

TRANSMISSION SYSTEM

The transmission system routing alternatives associated with either the Bonanza or Rangely plant sites would have the same type of impacts; however, the magnitude of the impacts would vary depending on the miles of each resource (e.g., vegetation types, visual quality) existing along the routes.

The transmission system corridors and line routes associated with the Rangely site would have a larger number of impacts than the system associated with the Bonanza site. This would be due to 34 miles of additional corridor and line lengths from the Rangely site.

The differences in the total systems for the two plant sites would be as follows:

Unit 1

Twenty-four miles of additional corridor and line location from the Rangely site for the 138-kV system to the Vernal and Rangely substations.

Unit 1 and 2

Ten miles of additional corridor and line location for the 345-138-kV system from the Rangely site to the Mona and Ben Lomond substations.

The preferred corridor and routes were largely determined by use of a procedure developed for evaluating potential environmental impacts of alternative electric transmission corridors. Refer to Appendix 12 for the description, methodology, and analysis of results of this evaluation procedure.

Transmission System From Either Bonanza or Rangely Plant Sites

Plant Site to Tank Hollow (345- 138-kV, Unit 1)

The BLM- and USFS-preferred route would be via Upalco-Sowers. All but 10 miles of this route would be located within existing corridors. Overall, the route has the fewest environmental impacts on a per mile basis and the fewest land use conflicts. The preferred design would be with double circuit capacity in anticipation of the unit 2 line. If only a single circuit design were used, the preferred action would be tower sharing with existing UP&L 138-kV lines for 30 miles in Sowers Canyon and joint use of the Hunter 3 345-kV lines between Deseret and UP&L for 8 miles in Spanish Fork Canyon.

The applicant-proposed alternative via Upalco-Fruitland has the disadvantage of establishing a new corridor across the Uinta National Forest which would be contrary to the Federal Land Policy and Management Act (FLPMA). Environmental impacts on a per mile basis would be greater, and conflicts would exist with a scenic loop road and an ORV closure. Additional conflicts would exist with the Uinta Nationl Forest Management Planning Standards and Guidelines for transmission corridors.

Tank Hollow to Mona (345-kV, Unit 1)

The BLM- and USFS-preferred route would be via Dairy Fork. This is also the applicant-proposed route. Lower capital costs are associated with the route. There are fewer or equal environmental impacts with the route as compared to other alternatives. Corridor sharing with the Rocky Mountain Pipeline Project would be possible for about 37 of the 49.6 mile length of the route.

138-kV Systems to Vernal and Rangely Substation

Bonanza Site

If the Bonanza site were selected, the BLM- and USFS-preferred route from Bonanza to the Rangely substation would be via Little Bonanza. This is also the applicant-proposed route. This route would have fewer environmental impacts, lower capital costs, and higher net energy efficiency than the Mellen Hill alternative.

There are no alternatives to the applicant's proposed route from Bonanza to the Vernal substation. No major impacts for the proposed route were identified.

Rangely Site

There are no alternatives to the applicant's proposed routes from the Rangely site to the Rangely and Vernal substations. No major impacts for the proposed routes were identified.

Plant Site to Ben Lomond (345-kV, Unit 2)

If the Moon Lake unit 2 were to provide power to the Wasatch Front, the BLM- and USFS-preferred alternative would be to double circuit with the unit 1 line to Mona and then construct a new 345-kV line from Mona to Ben Lomond along the Wasatch Front. The only additional impacts with this alternative over those of the unit 1 transmission system would be those impacts associated with the Mona-Ben Lomond (Wasatch Front) corridor. The Mona to Ben Lomond route parallels existing transmission corridors for the total length of the route.

If the unit 2 345-kV line were placed on unit 1 double circuit towers, any previous tower sharing or interties with existing 138- or 345-kV lines would require relocation and/or construction of towers for the original lines. Therefore, tower sharing and interties would be environmentally unacceptable if double circuit capacity were built into the unit 1 line to Mona.

The applicant's proposed route to Ben Lomond via Lone Tree has no environmental advantages but would encounter several disadvantages. The corridor would conflict with existing land use plans of the Ashley National Forest; an existing scenic loop road and an ORV closure area. It would open a new corridor across scenic back country, and would cross a wetland area.

RURAL ELECTRIFICATION ADMINISTRATION PREFERRED ALTERNATIVE

The REA-preferred action is to provide loan guarantee commitments to Deseret for construction of the project.

Due to the unresolved issues regarding the ability of Deseret to secure a firm and dependable water supply for the Rangely site development within the proposed time frame, the REA is designating the Bonanza plant site with the BLM- and USFS-preferred design components described previously as its preferred alternative.

With respect to the various transmission system and routing alternatives, REA agrees that the routing preference of the BLM and USFS (route associated with the initial unit as described previously) would make maximum use of corridor sharing and represents the most environmentally acceptable alternative.

Regarding the routing of the proposed unit 2 345-kV transmission line to the Ben Lomond substation, REA feels that the primary consideration for the routing of a second 345-kV line, the determination of future load centers, is too uncertain at the present time to justify the selection of a preferred route. While REA agrees that corridor sharing with the proposed unit 1 line to Mona would be the most environmentally acceptable route to Ben Lomond, the sharing of tower structures by both 345-kV lines would not be acceptable to REA. In this instance, REA does not believe that the environmental benefits that would be derived by double-circuiting of up to 74 miles of 345-kV lines are not commensurate with the increased risk to the interruption of electrical service. An areawide electrical outage could have a catastrophic impact on the residential, commercial, and industrial customers of the Deseret service

area. A single unscheduled outage could cost the consumers several hundred thousand dollars. The subject of reliability is further discussed in Appendix 6.

REA is also opposed to the tower sharing concepts as proposed by BLM and USFS. Attempts by Deseret to enter into such agreements with UP&L could seriously delay the completion of the project related transmission facilities with no assurances that such agreements would be successfully executed.

Tower sharing and interties with other utilities, which would delay development of the Moon Lake project, are unacceptable to REA. Attempts to reach such agreements could delay the proposed project with no assurances that interties or tower sharing agreements would be reached.

TABLE 2-13

Comparative Analysis Summary of
Unavoidable Adverse Impacts, Irreversible/Irretrievable
Commitment of Resources, and the Relationship of Short-Term Use of the Environment
to Maintenance and Enhancement of Long-Term Productivity
Assuming a 2-Unit Power Plant: Plant Site Alternatives

Environmental Elements (Resource)	Unavoidable Adverse Impacts	
	Bonanza Plant Site	Rangely Plant Site
Air Quality		
Standards	The release of pollutants into the atmosphere would be an unavoidable adverse impact. All State and Federal air quality standards would be met with 93.6 percent SO_2 control. However, oil shale development could possibly be limited because of consumption of the Colorado Cateory I SO_2 increment at Dinosaur from the power plant.	The release of pollutants into the atmosphere would be an unavoidable adverse impact. All State and Federal air quality standards would be met with 94.9 percent SO_2 control. However, oil shale development could possibly be limited because of consumption of the Colorado Cateory I SO_2 increment at Dinosaur. Interaction of pollutants would be less likely than with a plant at Bonanza.
Visibility	Under adverse meteorological conditions, a highly visible yellow-brown plume would be observed from Dinosaur National Monument. Impacts to visibility at Dinosaur would probably occur more frequently from a Bonanza plant than a Rangely plant due to prevailing air flow patterns.	Under adverse meteorological conditions, a highly visible yellow-brown plume would be observed from Dinosaur National Monument. Impacts to visibility at Dinosaur would probably occur less frequently from a Rangely plant than a Bonanza plant due to prevailing air flow patterns.
Water Resources	Withdrawal of 21,720 acre-feet of water from the Green River would remove 2 percent of its lowest recorded annual flow.	Withdrawal of 21,720 acre-feet of water from the Green River would remove 2 percent of its lowest recorded annual flow.
	TDS in the Green River would increase by 0.8 mg/ℓ at Green River, Utah and 1 mg/ℓ in the Colorado River at Imperial Dam in California.	TDS in the Green River would increase by 0.8 mg/ℓ at Green River, Utah and 1 mg/ℓ in the Colorado River at Imperial Dam in California.
Vegetation	Up to 82 acres of riparian vegetation and a number of cottonwoods could be removed by plant construction. Nine populations of a candidate threatened plant species (recommended for delisting) could be lost.	Up to 77 acres of riparian vegetation and a number of cottonwoods could be removed by plant construction. About 980 acres of seeded grassland would be lost. Two populations of a candidated threatened plant species (recommended for delisting) could be lost.
Animal Life		
Terrestrial	About 4 percent of the range of the Bonanza antelope herd would be occupied. Antelope would be disturbed during the critical fawning season. The population of the herd could be reduced due to loss of fawns, but this would be mitigated somewhat through the provision of permanent water sources in the Bonanza area.	About 2,202 acres of antelope habitat would be occupied. This is on the fringes of marginal habitat and impacts are expected to be minor.
	About 6 percent of the range of the Bonanza wild horse herd would be occupied. Due to the small size of the herd and the large area available to them, no loss of horses is expected.	No issue identified.
Aquatic	The Moon Lake project would impact the Green or White Rivers by reducing flows and is likely to jeopardize the continued existence of three endangered fish species. However, if water were purchased from Flaming Gorge, thus replacing water withdrawn from the Green River for the Moon Lake project, the endangered fishes would not be affected.	The Moon Lake project would impact the Green or White Rivers by reducing flows and is likely to jeopardize the continued existence of three endangered fish species. However, if water were purchased from Flaming Gorge, thus replacing water withdrawn from the Green River for the Moon Lake project, the endangered fishes would not be affected.
Cultural Resources	Eight sites, none of which are eligible to the National Register, would be disturbed. Impacts would be mitigated but some loss of scientific and educational information could result.	Twenty-one sites, one of which may be eligible to the National Register, would be disturbed. Impacts would be mitigated but some loss of scientific and educational information could result.

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
No	Project Life	Burning of coal would release pollutants into the atmosphere, but emissions would cease when plant operations cease. During the predicted 35 years of operation, subsequent air-polluting projects in the area may be limited.
No	Project Life	Any reduction in visual range or clarity would cease when plant operations cease.
No	Yes	Water quantity and quality would revert to present condition with cessation of pumping.
No	Yes	
Yes	Yes	It is not likely that this site would be totally restored to its native condition. The continued existence of threatened plant species would not be jeopardized.
No	Yes	Reductions in herd size would be only temporary and with new permanent sources of water in the Bonanza area, the Bonanza antelope herd may expand.
No	Yes	No short- or long-term loss of horses is expected.
Yes	Yes	Once lost, these species could not be replaced.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.

TABLE 2-13 (continued)

Environmental Elements (Resource)	Unavoidable Adverse Impact	
	Bonanza Plant Site	Rangely Plant Site
Visual Resources	Construction of a generating plant would modify landscape character and would not meet VRM objectives of the affected area. The plant would be visible to travelers (280 ADT) on Utah Highway 45 and to travelers on the Uintah County road to Red Wash.	Construction of a generating plant would modify landscape character and would not meet VRM objectives. The power plant would be visible to travelers on the Staley-Gordon Mine road.
Land Use	A loss of 150 AUMs of forage on BLM sheep allotments would occur as a result of construction of a plant at the Bonanza site. Less than 5 percent of the forage in any allotment would be removed.	A loss of 94 AUMs of forage on BLM sheep allotments would occur as a result of construction of a plant at Rangely. About 21 percent of the forage in the Redwash Allotment would be removed.
Socioeconomics Units 1 and 2 Scenario (including population related to the Deserado Mine development)		
Housing	Increased housing demand would place a burden on the current limited, middle-income housing supply of both Rangely and Vernal.	Increased housing demand would place a burden on the current limited, middle-income housing supply of both Rangely and Vernal.
Sewer and Water Systems	These systems in both communities would be inadequate unless expanded or improved.	These systems in both communities would be inadequate unless expanded or improved.
Community Services	Both Vernal and Rangely would need to expand services to retain present ratios or meet State standards.	Both Vernal and Rangely would need to expand services to retain present ratios or meet State standards.
Education	Additional teachers and facilities would be required in both communities in order to maintain present ratios: Uintah School District: about 21 teachers and 15 classrooms would be required; Rangely School District (RE-4): about 22 teachers and no additional classrooms would be required.	Additional teachers and facilities would be required in both communities in order to maintain present ratios: Uintah School District: about 13 teachers and 11 classrooms would be required; Rangely School District (RE-4): about 34 teachers and 4 classrooms would be required.
Local Government Impacts	There would be an imbalance of property tax revenue between Uintah and Rio Blanco Counties. In 1986, Uintah County revenues from project facilities would exceed expenditures by about $6,731,000. Rio Blanco County expenditures would exceed revenues from these facilities by about $996,000. This does not account for personal property tax, sales tax, state income tax, etc., on individuals that would provide additional revenues to the counties.	There would be an imbalance of property tax revenue between Uintah and Rio Blanco Counties. In 1986, Uintah County would receive no revenues from project facilities, but expenditures would be about $1,240,000. Rio Blanco County revenues would exceed expenditures by about $9,907,000. This does not account for personal property tax, sales tax, state income tax, etc., on individuals that would provide additional revenues to the counties.
Quality of Life	In either Vernal or Rangely, the influx of newcomers into the project area could alter the prevailing social order by the importation of value systems different from that of long-time residents. However, the project area has already experienced substantial energy related growth since World War II. Therefore, it can be expected that typical boomtown scenario impacts of conflicts between long-time residents and newcomers with resultant changes in community structures would be considerably less than in similar communities that have not had prior experiences with energy development.	In either Vernal or Rangely, the influx of newcomers into the project area could alter the prevailing social order by the importation of value systems different from that of long-time residents. However, the project area has already experienced substantial energy related growth since World War II. Therefore, it can be expected that typical boomtown scenario impacts of conflicts between long-time residents and newcomers with resultant changes in community structures would be considerably less than in similar communities that have not had prior experiences with energy development.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
No	Project Life	Aesthetic values would change as perceived by the public, but change would not be permanent. Local people would become accustomed to the change, but persons traveling through the area may realize the short-term loss of the quality of the present visual experience.
No	Yes	The grazing capacity would be lost for the life of the project. Following reclamation, grazing capacity could increase.
No	Yes	There would be a short-term shortage of housing in both Rangely and Vernal which may be followed by a short-term excess in housing. This is not expected to be a long-term problem with the future projected energy-related population.
No	No	This growth would place a demand on the communities to develop adequate sewer and water systems somewhat sooner than they would without the project.
No	No	More manpower and equipment would be needed sooner with the project than without the project.
No	Yes	More teachers and classrooms would be needed sooner with the project than without the project.
Yes	Yes	Short-term deficiencies in Uintah or Rio Blanco County services would result. Deficiences would have to be corrected over the long term.
Yes	Yes	This is a long-term change in lifestyles and the quality of life.

TABLE 2-13 (continued)

Coal Source Alternatives[a]

Environmental Elements (Resource)	Unavoidable Adverse Impacts	Commitment of Resources: Irreversible	Commitment of Resources: Irretrievable	Relationship of Short-Term Use of Environment to Long-Term Productivity
DESERADO MINE				
Topography	Subsidence and earth related fracture could occur above the mine. About 5,100 surface acres would be affected. Changes would likely be subtle and unnoticed by the casual observer.	Yes	Yes	Once subsidence occurred, the original topography could never be restored. Subsidence from long-wall mining would be almost immediate while room-and-pillar areas would continue to subside over a long period of time. Forty-five percent of the coal reserves of the mine (57,251,000 tons) would be trapped underground and would not be available for future use.
Water Resources	About 304 acre-feet of water would be required at the mine portal. This represents 0.06 percent of the average annual flow and 0.14 percent of the lowest recorded annual flow of the White River in Colorado. The water quality of the White or Green Rivers would not be altered.	No	Yes	Present flows and quality of water would be reestablished with cessation of pumping.
Vegetation	About 120 acres of riparian vegetation would be disturbed during development of the mine. No threatened or endangered species have been found on areas that would be affected by the Deserado Mine.	No	Yes	The disturbed areas could be restored to their native condition within 10 to 20 years.
Animal Life				
Aquatic	Withdrawal of water from the White River could jeopardize the continued existence of three endangered fish species during low-flow and drought conditions. However, if water normally withdrawn for irrigation were allowed to remain in the river, there would be no jeopardy to the species.	Yes	Yes	Once lost, these species could not be replaced.
Cultural Resources	Four sites, none of which are eligible to the National Register would be directly disturbed at the refuse disposal area. Forty-three sites four of which are eligible to the National Register, could be affected by subsidence from the mine. Impacts would be mitigated but some loss of scientific and educational information could result.	Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
Visual Resources	The refuse disposal area would modify the landscape character and would not meet BLM VRM objectives for the affected area.	No	Yes	There would be a short-term loss of visual quality but, beyond the life of the project, vegetation would be reestablished and visual quality restored. Persons traveling through the area could realize the short-term loss of the quality of the present visual experience.
Land Use	A loss of 84 AUMs of forage on two BLM sheep allotments would occur. Three percent of the forage on one allotment, and 9 percent on the other would be removed.	No	Yes	The grazing capacity in the allotments would be lost for the life of the project. Following reclamation, grazing capacity could be increased.
Socioeconomics	Population-related impacts from the Deserado Mine work force are included in the analysis of the Bonanza and Rangely plant site.	--	--	--

[a]The unavoidable adverse impacts of open market purchase of coal will be covered in regional coal environmental impact statements. The unavoidable adverse impact of coal transport with open market purchase of coal would be as discussed for the on-highway method of coal transport for the Deserado Mine. Should the coal supply of the Deserado Mine be insufficient or if Deseret is unable to obtain additional leases contiguous to the mine, open market purchase of coal may be required for up to 15 years of the 35-year project.

TABLE 2-13 (continued)

Coal Transport Alternatives

Environmental Elements (Resource)	Unavoidable Adverse Impacts		
	Electric Railroad and Off-Highway Truck Haul	Overland Conveyor	Slurry Pipeline
Bonanza Plant Site Alternatives			
Water Resources	No issue identified	No issue identified.	Withdrawal of 1,375 acre-feet from the White River for slurry operation would represent 0.27 percent of the average flow and 0.62 percent of the lowest recorded annual flow.
Vegetation	The railroad would remove 5 acres of riparian vegetation. The railroad mainline would pass through the habitat of a proposed threatened plant species. Off-highway truck haul would remove 4 acres of riparian vegetation. The off-highway truck haul route would pass through the habitat of one proposed threatened plant species.	The conveyor would remove 1 acre of riparian vegetation. It would also pass through habitat of seven threatened and endangered plant species (one proposed threatened, one proposed endangered, and five recommended for delisting).	The slurry pipeline would remove 2 acres of of riparian vegetation. It would also pass through habitat of seven threatened and endangered plant species (one proposed threatened, one proposed endangered, and five recommended for delisting).
Animal Life	No issue identified.	No issue identified.	Withdrawal of water from the Green or White Rivers for the Moon Lake project by itself would not likely result in a loss of any fish species nor adversely affect their essential habitat. However, the cumulative impacts of water withdrawal for this and other proposed projects could jeopardize the continued existence of three officially endangered fish species of the Colorado River system.
Cultural Resources	Construction of the railroad system could damage or destroy 16 sites, one of which may be eligible to the National Register.	Construction of the conveyor could disturb 21 sites, none of which are eligible to the National Register.	Construction of the slurry could disturb 9 sites, none of which are eligible to the National Register.
Visual Resources	Both systems would be a visual intrusion in the Devils Playground, an area of geologic interest (Class B scenery, Management Class IV). The coal storage and loadout area would modify landscape character and would not meet VRM objectives for the affected areas	The conveyor would not meet VRM objectives for 1 mile of Class III area. It would be of high visual contrast to travelers on Colorado Highway 64 (2,000 ADT) and on Utah Highway 45 (280 ADT). It would be an intrusion in the Devils Playground.	No issue identified.
Land Use	No issue identified.	No issue identified.	No issue identified.
Rangely Plant Site Alternatives			
Water Resources	No issue identified (the electric railroad is not an alternative for the Rangely site).	No issue identified.	No issue identified (the slurry pipeline is not an alternative for the Rangely site).
Cultural Resources	No issue identified (the electric railroad is not an alternative for the Rangely site).	Construction of the overland conveyor could damage or destroy one site. It is not eligible to the National Register.	No issue identified (the slurry pipeline is not an alternative for the Rangely site).

TABLE 2-13 (continued)

On-Highway Truck Haul	Commitment of Resources Irreversible	Irretrievable	Relationship of Short-Term Use of Environment to Long-Term Productivity
No issue identified.	No	Yes	Water quality and quantity would revert to present condition with cessation of pumping.
No issue identified.	No	Yes	It is not likely that the continued existence of any plant species would be jeopardized. Disturbed areas would not likely be restored to their native condition.
Deer, antelope, and sage grouse mortality would increase on affected highways.	No	Yes	Reduction in populations could occur for the life of the project. Populations could return to present levels within a few years after the project life.
Construction of 5.0 miles of road could disturb 6 sites, none of which are eligible to the National Register.	Yes	Yes	Disturbance or destruction of cultural resources would result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
The road would be a visual intrusion in the Devils Playground, an area of geologic interest (Class B scenery, Management Class IV).	No	Project Life	There would be a short-term loss of visual quality, but this is not expected to last beyond the life of the project.
There would be approximately a 323-percent increase in daily traffic on Utah Highway 45 and up to 117 percent on the affected portion of U.S. 40. Trucks would create a safety hazard and several accidents per year could be expected. Highway damage, with associated maintenance costs, would increase. Noise levels at the Town of Dinosaur would increase to approximately 86 dBA. Increases in frequency and magnitude of noise would be realized. This could result in a disruption of community activities.	No	Yes	During the life of the project, highway maintenance costs would increase. The daily traffic would return to normal following the project. Loss of human life from accidents is irreversible.
No issue identified.	No	Yes	Water quality and quantity would revert to its present condition with cessation of pumping.
No issue identified.	Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the infomation could never be regained.

TABLE 2-13 (continued)

Water Source Alternatives

Environmental Elements (Resource)	Unavoidable Adverse Impacts		
	Taylor Draw Reservoir	Wolf Creek Reservoir	Purchase of Agricultural Water For Release into the White River
Rangely Site			
Water Resources	Water temperature would be reduced below the Taylor Draw Dam and flow would be altered.	Water temperature would be reduced below the Wolf Creek Dam and flow would be altered.	Reduction in flow is unknown. Salinity would be reduced through elimination of irrigation return flows that are typically high in TDS.
Vegetation	Fifty acres of riparian vegetation would be inundated. No threatened or endangered plant survey has been done in this area.	Two hundred and sixty-three acres of riparian vegetation would be inundated. No threatened or endangered plant survey has been done in this area.	No issue identified.
Aquatic	The dam would create a barrier and block the movement of fish from the Green River. Colorado squawfish would not utilize the altered habitat.	The dam would create a barrier and block the movement of fish from the Green River. Colorado squawfish would not utilize the altered habitat.	Actual reduction in flows and its effects on endangered fish are unknown.
Cultural Resources	Two known sites, both of which may be eligible to the National Register, could be disturbed or damaged during construction. Intensive inventories of this area have not been done.	Two known sites, both of which may be eligible to the National Register, could be disturbed or damaged during construction. Intensive inventories of this area have not been done.	No issue identified.
Visual Resources	The dam would modify landscape character and would not meet BLM's VRM objectives in the affected area.	The dam would modify landscape character and would not meet BLM's VRM objectives in the affected area.	No issue identified.
Land Use	Four hundred acres, 176 of which are prime farmlands would be inundated. This represents 20 percent of the irrigated land in Rio Blanco County and 7 percent of the prime farmlands along the White River near Rangely. Thirty-one hundred linear feet of Colorado Highway 64 would be inundated and would have to be relocated. Traffic flow would be temporarily interrupted.	Four hundred and three acres of irrigated (not-prime) farmland would be inundated. Four ranch houses and one suspension bridge with an exposed gas pipeline would also be inundated. This represents 20 percent of the irrigated land in Rio Blanco County.	Deseret would purchase an amount equivalent to 47 percent of the water presently used for irrigated agriculture in the upper White River basin. This gives an indication of the percent of agricultural land in the upper White River basin that could be occasionally retired.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
No	Yes	This effect of the reservoir would continue for the life of the reservoir. With purchase of agricultural water, water quantity and quality would return to normal after the life of the Moon Lake project.
No	Yes	With the reservoir, vegetation would be lost for the life of the reservoir and could be reestablished if the reservoir were filled or drained. With the collection well system, riparian vegetation would reestablish on all but the occupied acreage (3 acres) within 10 to 20 years.
Yes	Yes	This could be a long-term loss of habitat. The dam could likely be a barrier in perpetuity. Long-term effects of purchase of agricultural water are not known.
Yes	Yes	Disturbance or destruction of cultural resources would result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the infomation could never be regained.
Yes	Yes	This could be a long-term loss of the resource.
No	Yes	These losses would be for the life of the project. Water quality and quantity would return to normal following the end of the project.

TABLE 2-13 (continued)

Water Transport Alternatives[a]

Environmental Elements (Resource)	Unavoidable Adverse Impacts: Green River Pipeline	White River Pipelines
Bonanza Site		
Vegetation	Twenty acres of riparian vegetation could be removed during construction. The route passes through habitat of five threatened or endangered plant species, one proposed as threatened and four recommended for delisting).	Six acres of riparian vegetation could be removed during construction.
Cultural Resources	Two sites, neither of which is eligible to the National Register, could be disturbed or damaged during construction.	Three sites, one of which may be eligible to the National Register, could be disturbed or damaged during construction.
Visual Resources	No issue identified.	The pipeline would not meet the VRM objectives for 2 miles of VRM Class II area until revegetation was achieved (10-20 years).
Rangely Site[b]		
Vegetation	Ten acres of riparian vegetation could be removed during construction.	Less than 1 acre of riparian vegetation could be removed during construction.
Cultural Resources	One site, which is not eligible to the National Register, could be disturbed or damaged during construction.	No sites have been identified on this route.
Visual Resources	No issues identified.	The pipeline would not meet VRM Class II VRM objectives for 3 miles until revegetation was achieved (10-20 years).

[a]The impacts on water quality and quantity in the Green and White Rivers are presented with the discussion on plant site alternatives.

[b]No major unavoidable adverse impacts have been identified for the Taylor Draw Reservoir pipeline to the Rangely site. Only the impacts of the Wolf Creek Reservoir pipeline are listed in the table.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
No	Yes	Vegetation could be restored to its native condition in 10 to 20 years. The continued existence of threatened or endangered plant species would not be jeopardized.
Yes	Yes	Disturbance or destruction of cultural resources would result in a loss of some scientific understanding. Present salvage techniques do not insure total information recovery. Once lost, the infomation could never be regained.
No	Yes	Visual intrusion would only be temporary until vegetation was restored.
No	Yes	Vegetation could be restored to its native condition in 10-20 years.
Yes	Yes	Disturbance or destruction of cultural resources would result in a loss of some scientific understanding. Present salvage techniques do not insure total information recovery. Once lost, the infomation could never be regained.
No	Yes	Visual intrusion would only be temporary until vegetation was restored.

TABLE 2-13 (continued)

Transmission System Alternatives
Bonanza Unit 1 Routing Alternatives - 345-138-kV Combined System

Environmental Element (Resource)	Unavoidable Adverse Impacts Bonanza-Tank Hollow via Upalco-Fruitland	via Upalco-Sowers Canyon	via Castle Peak-Sowers Canyon
Soils	Route would cross 45 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 57 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 57 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected Complete revegetation and stabilization of soils could take 10 to 20 years.
Vegetation	12.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	19.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	45 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.
Animal Life	There would be a small but unquantifiable loss of waterfowl (9 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (3 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (14 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	No sites have been identified along this route.	No sites have been identified along this route.	No sites have been identified along this route.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 6 highways having a total ADT of 7,870. Aesthetic values would be reduced. The line would not meet VRM objectives for 14.5 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from four recreation attraction areas having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 6 highways having a total ADT of 1,120. Aesthetic values would be reduced. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from one recreation attraction area having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 3 highways having a total ADT of 7,130. Aesthetic values would be reduced.
Land Use	New access into USFS off-road vehicle closure areas would lead to an increase in ORV use.	No issue identified.	No issue identified.

TABLE 2-13 (continued)

Via Castle Peak-Fruitland	Commitment of Resources		Relationship of Short-Term Use of Environment to Long-Term Productivity
	Irreversible	Irretrievable	
Route would cross 45 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	No	Yes	Increases in erosion would continue until soils were revegetated within 10 to 20 years.
58 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	Yes	Yes	Vegetation could be restored to its native condition in 10 to 20 years. Once displaced, small populations of threatened or endangered plants may never be reestablished.
There would be a small but unquantifiable loss of waterfowl (28 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	No	Yes	Short-term decreases in local populations of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Construction could damage one site. It is not eligible for nomination to the National Register.	Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
The transmission lines would introduce a medium to high increment in contrast at crossings over 4 highways having a total ADT of 4,765. Aesthetic values would be reduced. The line would not meet VRM objectives for 9.5 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from two recreation attraction areas having special values.	No	Yes	Visual intrusion would remain for the life of the transmission lines.
New access into USFS off-road vehicle closure areas would lead to an increase in ORV use. This route would cross 4 miles of urban area and could conflict with future expansion.	Yes	Yes	Once used by ORVs the new access would likely be kept open indefinitely through continued use. Urban conflicts would continue for the life of the project.

TABLE 2-13 (continued)

Bonanza or Rangely Unit 1 Routing Alternatives
Price Canyon to Water Hollow Single Circuit 345-kV

Environmental Element (Resource)	Unavoidable Adverse Impacts via Eccles Canyon	Via Sowers Canyon/Dairy Fork	Via Sowers Canyon/Thistle
Soils	Route would cross 39.5 miles of severe erosion hazard soils. Highly dissected steep slopes exist for 5.5 miles. Erosion would be localized on disturbed areas. Complete revegetation and stabilization of soils could take 10 to 20 years unless slumps and slides result; complete revegetation and stabilization of soils on slump and slide areas would be improbable.	Route would cross 54.5 miles of severe erosion hazard soils. Highly dissected steep soils exist for 5.0 miles. Erosion would be localized on disturbed areas. Complete revegetation and stablization of soils could take 10 to 20 years.	Route would cross 55.0 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas. Complete revegetation and stabilization of soils could take 10 to 20 years.
Visual Resources and Recreation	The transmission line would introduce a high increment in contrast over heavily used dispersed and developed recreation areas; i.e., campground, summer homes, scenic road, youth camp, winter sports concentration area. The line would not meet VRM objectives for 6.3 miles VRM Class II and III areas. Visitors would be distracted from recreational pursuits by the presence of a new transmission line. The transmission line in this area would be visible from nine recreation areas having special values.	The transmission line would introduce a medium increment in contrast at one highway crossing and along 25 miles of a major Federal highway and a high increment in contrast over 29.5 miles of undeveloped areas.	The transmission line would introduce a medium increment in contrast at one highway crossing and along 30 miles of a major Federal highway and a medium increment in contrast along 10 miles of a State highway.
Land Use	This route would cross 1.0 mile of coal mining operations. The transmission line would conflict with existing and continued coal mining developments. Projected subsidence from coal mining operations would cause difficulties with transmission line tower site locations. The route would conflict with the scenic road designation for Skyline Drive, so designated by National Forest Land Management Planning feasibility studies.	No issue identified.	No issue identified.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of Environment to Long-Term Productivity
Irreversible	Irretrievable	
Yes	Yes	Increases in erosion would continue until soils were revegetated and stabilized. The Eccles Canyon route could experience long-term productivity loss on slump and slide areas resulting from powerline construction activities.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
No	Yes	The transmission line towers could be subject to unstable topography. The transmission line and towers would conflict with coal mining operations and facilities.

TABLE 2-13 (continued)

Bonanza or Rangely Unit 1 Routing Alternatives
Tank Hollow to Mona 345-kV System

Environmental Element (Resource)	Unavoidable Adverse Impacts		
	via Dairy Fork	via Thistle Canyon	via Utah Valley
Soils	Route would cross 48.8 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 50.1 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 41.6 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.
Vegetation	2.0 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized. Twelve miles of wet meadow marsh could be crossed. This vegetation type is fragile and of special management concern.	2.2 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	2.2 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.
Cultural Resources	Construction could damage 2 sites, neither of which are eligible for nomination to the National Register.	Construction could damage 2 sites, neither of which are eligible for nomination to National Register.	No sites have been identified along this route.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 3 highways having a total ADT of 9,775. Aesthetic values would be reduced.	The transmission lines would introduce a medium to high increment in contrast at crossings over 4 highways having a total ADT of 14,775. Aesthetic values would be reduced.	The transmission lines would introduce a medium to high increment in contrast at crossings over 4 highways having a total ADT of 14,800. Aesthetic values would be reduced. The line would not meet VRM objectives for 19.3 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from four recreation attraction areas having special values.
Land Use	This route would cross 1 mile of urban area and could conflict with future expansion.	This route would cross 1 mile of urban area and could conflict with future expansion.	This route would cross 6 miles of urban area and could conflict with future expansion.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
No	Yes	Increases in erosion would continue until soils were revegetated within 10 to 20 years.
Yes	Yes	Vegetation could be restored to its native condition in 10 to 20 years. Once displaced, small populations of threatened or endangered plants may never be reestablished.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
Yes	Yes	Once used by ORVs the new access would likely be kept open indefinitely through continued use. Urban conflicts would continue for the life of the project.

TABLE 2-13 (continued)

Bonanza Unit 1 Routing Alternatives
Bonanza to Vernal and Bonanza to Rangely
138-kV System

Environmental Element (Resource)	Unavoidable Adverse Impacts		
	Bonanza-Vernal	Bonanza-Rangely Sub. via Little Bonanza	Bonanza-Rangely Sub. via Mellon Hill
Vegetation	8 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	6.2 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	3 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.
Animal Life	There would be a small but unquantifiable loss of waterfowl (1 mile of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (1 mile of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of birds from collisions with power-lines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	No sites have been identified along this route.	Construction could damage 1 known site which is not eligible for nomination to the National Register.	No sites have been identified along this route.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 3 highways having an unknown total ADT. Aesthetic values would be reduced.	The transmission lines would introduce a medium to high increment in contrast at crossings over 1 highway with a total ADT of 285. Aesthetic values would be reduced.	The transmission lines would introduce a medium to high increment in contrast at crossings over 2 highways having a total ADT of 2,285. Aesthetic values would be reduced.
Land Use	No issue identified.	This route would cross 2 miles of urban area and could conflict with future expansion.	This route would cross 3 miles of urban area and could conflict with future expansion.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
Yes	Yes	Vegetation could be restored to its native condition in 10 to 20 years. Once displaced, small populations of threatened or endangered plants may never be reestablished.
No	Yes	Short-term decreases in local populations of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
Yes	Yes	Urban conflicts would continue for the life of the project.

TABLE 2-13 (continued)

Bonanza Unit 2 Routing Alternatives
Bonanza to Mountain Green - 345-kV System

Environmental Element (Resource)	Unavoidable Adverse Impacts via Lone Tree	via Upalco-Fruitland	via Castle Peak-Fruitland
Soils	Route would cross 103.5 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 62 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 62 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected Complete revegetation and stabilization of soils could take 10 to 20 years.
Vegetation	17 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized. 12 miles of wet meadow marsh could be crossed. This vegetation type is fragile and of special management concern.	9.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	40 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.
Animal Life	There would be a small but unquantifiable loss of waterfowl (27 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (18.5 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (27.5 miles of flyway) and birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	Construction could damage 2 sites, neither of which are eligible for nomination to the National Register.	No sites have been identified along this route.	Construction could damage 1 site, which is not eligible for nomination to the National Register.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 7 highways having a total ADT of 13,025. Aesthetic values would be reduced. The line would not meet VRM objectives for 24 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from four recreation attraction areas having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 4 highways having a total ADT of 11,780. Aesthetic values would be reduced. The line would not meet VRM objectives for 14.5 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from five recreation attraction areas having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 6 highways having a total ADT of 14,800. Aesthetic values would be reduced. The line would not meet VRM objectives for 2 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from three recreation attraction areas having special values.
Land Use	A loss of prime commercial timber would occur along Segment 35 in Ashley National Forest. New access into USFS off-road vehicle closure areas would lead to an increase in ORV use. This route would cross 6 miles of urban area and could conflict with future expansions.	No issue identified.	No issue identified.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
No	Yes	Increases in erosion would continue until soils were revegetated within 10 to 20 years.
Yes	Yes	Vegetation could be restored to its native condition in 10 to 20 years. Once displaced, small populations of threatened or endangered plants may never be reestablished.
No	Yes	Short-term decreases in local population of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
Yes	Yes	Some loss of prime commercial timber would occur during the life of the project. If the transmission lines were removed, the area would be returned to timber production. Once used by ORVs the new access would likely be kept open indefinitely through continued use. Urban conflicts would continue for the life of the project.

TABLE 2-13 (continued)

Rangely Unit 1 Routing Alternatives
345-138-kV Combined System

Environmental Element (Resource)	Unavoidable Adverse Impacts — Rangely-Tank Hollow via Upalco-Fruitland	via Upalco-Sowers Canyon	via Castle Peak-Sowers Canyon
Soils	Route would cross 45 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 57 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 57 miles of severe erosion hazard soils Erosion would be localized on disturbed areas and no impacts on other resources are expected Complete revegetation and stabilization of soils could take 10 to 20 years.
Vegetation	9.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	19.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	43.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.
Animal Life	There would be a small but unquantifiable loss of waterfowl (4.9 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (3.9 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (24 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	Construction could damage two sites one of which may be eligible for nomination to the National Register.	Construction could damage two sites one of which may be eligible for nomination to the National Register.	Construction could damage one site It is not eligible for nomination to the National Register.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 9 highways having a total ADT of 9,890. Aesthetic values would be reduced. The line would not meet VRM objectives for 18.5 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from four recreation attraction areas having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 9 highways having a total ADT of 13,520. Aesthetic values would be reduced. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from one recreation attraction area having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 6 highways having a total ADT of 9,095. Aesthetic values would be reduced. The line would not meet VRM objectives for 3.5 miles of VRM Class II area.
Land Use	New access into USFS off-road vehicle closure areas would lead to an increase in ORV use.	No issue identified.	This route would cross 4 miles of urban area and could conflict with future expansions.

TABLE 2-13 (continued)

Via Castle Peak-Fruitland	Commitment of Resources: Irreversible	Commitment of Resources: Irretrievable	Relationship of Short-Term Use of Environment to Long-Term Productivity
Route would cross 45 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	No	Yes	Increases in erosion would continue until soils were revegetated within 10 to 20 years.
41 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	Yes	Yes	Vegetation could be restored to its native condition in 10 to 20 years. Once displaced, small populations of threatened and endangered plants may never be reestablished.
There would be a small but unquantifiable loss of waterfowl (18 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	No	Yes	Short-term decreases in local populations of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Construction could damage one site. It is not eligible for nomination to the National Register.	Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. If lost, the information could never be regained.
The transmission lines would introduce a medium to high increment in contrast at crossings over 3 highways having a total of 5,840. Aesthetic values would be reduced. The line would not meet VRM class objectives for 6 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from two recreation attraction areas having special values.	No	Yes	Visual intrusion would remain for the life of the transmission lines.
New access into USFS off-road vehicle closure areas would lead to an increase in ORV use.	Yes	Yes	Once used by ORVs the new access would likely be kept open indefinitely through continued use.

TABLE 2-13 (continued)

Rangely Unit 1 Routing Alternatives
Rangely to Vernal and Rangely to SW Rangely Substation
Bonanza to Vernal and Bonanza to Rangely
138-kV System

Environmental Element (Resource)	Unavoidable Adverse Impacts: Rangely-Vernal	Unavoidable Adverse Impacts: Rangely to SW Rangely Substation
Vegetation	2 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	No issue identified.
Animal Life	There would be a small but unquantifiable loss of waterfowl (1 mile of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (9 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	Construction could damage 3 sites, 2 of which may be eligible for nomination to the National Register	No sites have been identified along this route.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 3 highways having an unknown total ADT. Aesthetic values would be reduced.	The transmission lines would introduce a medium to high increment in contrast at crossings over 2 highways with a total ADT of 1,680. Aesthetic values would be reduced.
Land Use	No issue identified.	This route would cross 2 miles of urban area and could conflict with future expansion.

TABLE 2-13 (continued)

Commitment of Resources		Relationship of Short-Term Use of
Irreversible	Irretrievable	Environment to Long-Term Productivity
Yes	Yes	Once displaced, small populations of threatened or endangered plants may never be reestablished.
No	Yes	Short-term decreases in local population of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
No	Yes	Conflicts would continue for the life of the transmission lines.

TABLE 2-13 (continued)

Rangely Unit 2 Routing Alternatives
Rangely to Mountain Green - 345-kV System

Environmental Element (Resource)	Unavoidable Adverse Impacts via Lone Tree	via Upalco-Fruitland	via Castle Peak-Fruitland
Soils	Route would cross 103.5 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 62 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 62 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.
Vegetation	12 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized. 12 miles of wet meadow marsh could be crossed. This vegetation type is fragile and of special management concern.	8.5 miles of threatened or endangered species habitat would be crossed by this route. Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.	38.5 miles of threatened or endangered species habitat would be crossed by this route. .Even with federally required measures, it is possible that individual plants of the species could be destroyed. The continued existence of the species would not be jeopardized.
Animal Life	There would be a small but unquantifiable loss of waterfowl (27 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (19.4 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (37.5 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	Construction could damage 3 sites, 2 of which may be eligible for nomination to the National Register.	Construction could damage 3 sites, 2 of of which may be eligible for nomination to the National Register.	Construction could damage 1 site, which is not eligible for nomination to the National Register.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 6 highways having a total ADT of 13,005. Aesthetic values would be reduced. The line would not meet VRM objectives for 24 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from four recreation attraction areas having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 13 highways having a total ADT of 11,780. Aesthetic values would be reduced. The line would not meet VRM objectives for 14.5 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from five recreation attraction areas having special values.	The transmission lines would introduce a medium to high increment in contrast at crossings over 13 highways having a total ADT of 11,780. Aesthetic values would be reduced. The line would not meet VRM objectives for 5.5 miles of VRM Class II area. Visitors could be distracted from their recreational pursuits by the presence of new transmission lines. The transmission line would be visible from three recreation attraction areas having special values.
Land Use	A loss of prime commercial timber would occur along Segment 35 in Ashley National Forest. New access into USFS off-road vehicle closure areas would lend to an increase in ORV use. This route would cross 6 miles of urban area and could conflict with future expansions.	No issue identified.	New access into USFS off-road vehicle closure areas would lead to an increase in ORV use. This route would cross 4 miles of urban area and could conflict with future expansion.

TABLE 2-13 (continued)

Commitment of Resources: Irreversible	Commitment of Resources: Irretrievable	Relationship of Short-Term Use of Environment to Long-Term Productivity
No	Yes	Increases in erosion would continue until soils were revegetated within 10 to 20 years.
Yes	Yes	Once displaced, small populations of threatened or endangered plants may never be reestablished.
No	Yes	Short-term decreases in local population of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
Yes	Yes	Some loss of prime commercial timber would occur during the life of the project. If the transmission lines were removed, the area would be returned to timber production. Conflicts would exist for the life of the transmission lines. Once used by ORVs the new access would likely be kept open indefinitely through continued use. Urban conflicts would continue for the life of the project.

TABLE 2-13 (concluded)

Bonanza or Rangely Unit 2 Routing Alternatives
345-kV System

Environmental Element (Resource)	Unavoidable Adverse Impacts	
	Mountain Green-Ben Lomond	Mona-Ben Lomond
Soils	Route would cross 2 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected. Complete revegetation and stabilization of soils could take 10 to 20 years.	Route would cross 14 miles of severe erosion hazard soils. Erosion would be localized on disturbed areas and no impacts on other resources are expected Complete revegetation and stabilization of soils could take 10 to 20 years.
Vegetation	No issued identified.	10.5 miles of marshland that are of special management concern would be crossed by transmission lines.
Animal Life	There would be a small but unquantifiable loss of birds from collisions with power-lines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.	There would be a small but unquantifiable loss of waterfowl (15 miles of flyway) and other birds from collisions with powerlines and towers. There would be an increase in illegal shooting loss of raptors and big game from new access provided by access roads.
Cultural Resources	No sites have been identified along this route.	No sites have been identified along this route.
Visual Resources and Recreation	The transmission lines would introduce a medium to high increment in contrast at crossings over 2 highways having a total ADT of 11,260. Aesthetic values would be reduced. The line would not meet VRM objectives for 3 miles of VRM Class II area.	The transmission lines would introduce a medium to high increment in contrast at crossings over 19 highways having a total ADT of 125,395. Aesthetic values would be reduced.
Land Use	This route would cross 19 miles of urban area and could conflict with future expansion.	This route would cross 43.7 miles of urban area and could conflict with future expansion.

TABLE 2-13 (concluded)

Commitment of Resources		Relationship of Short-Term Use of Environment to Long-Term Productivity
Irreversible	Irretrievable	
No	Yes	Increases in erosion would continue until soils were revegetated within 10 to 20 years.
No	Yes	Vegetation could be restored to its native condition in 10 to 20 years.
No	Yes	Short-term decreases in local populations of waterfowl could result. Losses would continue until removal of the transmission lines. This could continue beyond the life of the generating station depending on the need for the transmission lines.
Yes	Yes	Disturbance or destruction of cultural resources could result in a loss of some scientific understanding. Present salvage techniques do not ensure total information recovery. Once lost, the information could never be regained.
No	Yes	Visual intrusion would remain for the life of the transmission lines.
No	Yes	Conflicts would exist for the life of the transmission line.

CHAPTER 3
AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes only the "significantly" affected environment including areas of controversy, high public interest, or resources covered by law. No attempt at encyclopedic description of the "existing environment" has been made.

This chapter is divided into three major sections: plant site and raw material supply systems, the secondary influence zone, and transmission systems.

The affected environment along linear facilities (i.e., coal transport routes, water pipelines, and transmission system alternative routes) are shown in the environmental profiles (figures 3-8 through 3-23) at the end of this chapter.

PLANT SITE AND RAW MATERIAL SUPPLY SYSTEMS

CLIMATE AND AIR QUALITY

CLIMATE

The Uinta Basin is located in a semi-arid continental climatic regime, characterized by meager precipitation (approximately 8 inches per year), extreme evaporation, cold and dry winters, and hot and dry summers (U.S. Dept. of Agriculture [USDA], 1978; Hidore, 1972). Precipitation is greatest in spring and early fall. Clear skies prevail most of the year, with strong insolation during the day and rapid nocturnal cooling resulting in wide daily temperature ranges (National Oceanic and Atmospheric Administration [NOAA], 1974). During the night, cold air drainage from higher elevations surrounding the Uinta Basin results in a high frequency of inversions and fog, especially during the winter months.

AIR QUALITY

National Ambient Air Quality Standards (NAAQS) established for protection of human health and public welfare (protection of vegetation, animals, and property) are shown in table 3-1. Also shown in table 3-1 are particulate, sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) concentrations measured during 1978 near Vernal by the State of Utah and ozone concentrations monitored near the Ua and Ub oil shale tracts south of Bonanza, Utah. No monitoring of trace elements has been done. Sulfur dioxide concentrations were far below the standards. Particulate concentrations, which were within standards, consisted largely of suspended soil particles. Nitrogen dioxide concentrations were well below the NAAQS. Ozone concentrations have approached the NAAQS (table 3-1), but it is expected that the ozone originated from natural rather than human-related sources, possibly from subsidence of stratospheric ozone. Lead, hydrocarbons, and carbon monoxide have not been monitored in the region. Because these pollutants are emitted primarily from vehicles and are generally urban pollutants, concentrations are expected to be low.

TABLE 3-1

Comparison of NAAQS and Pollutant Concentrations Measured Near the Site for 1978

Pollutant	NAAQS ($\mu g/m^3$)[a]	Present Concentrations	Present Percent of NAAQS
Sulfur Dioxide (SO_2)			
Annual	80	0	0
24-hour	365	27	7
3-hour	1,300	27	2
Total Suspended Particulates (TSP)			
Annual	60	31	52
24-hour	150	105	70
Nitrogen Dioxide (NO_2)			
Annual	100	18	18
Lead			
Annual	1.5	--[b]	--
Ozone (O_3)			
Annual	240	190[c]	79
Hydrocarbons			
3-hour	160	--[b]	--
Carbon Monoxide (CO)			
8-hour	10,000	--[b]	--
1-hour	40,000	--[b]	--

Source: Utah Bureau of Air Quality, 1979 and Aerovironment, 1977.

[a]Micrograms per cubic meter.

[b]Has not been monitored in the region; concentrations are expected to be low.

[c]Recorded at Utah oil shale tracts in 1975 by Aerovironment.

Both the Bonanza and Rangely sites are located in a Prevention of Significant Deterioration (PSD) Class II area. Class II areas allow air quality deterioration associated with moderate, well controlled growth. The closest point in Dinosaur National Monument (Dinosaur) is the headquarters located 20 miles northeast of the Bonanza site and 17 miles west-northwest of the Rangely site. Dinosaur has been identified by the Secretary of the Interior as an area where air quality related values are important attributes (Federal Register, June 25, 1980). The State of Colorado has designated the portions of Dinosaur within Colorado as Colorado Category I for SO_2, which carries the same incremental limitations on increased SO_2 concentrations as Federal Class I areas. Class I areas are those in which practically any air quality deterioration would be considered significant.

The National Park Service (NPS) has been monitoring visibility at Dinosaur using telephotometers since 1978. The limited data available give mean visual ranges of about 120 miles during summer 1978, 105 miles during spring 1979, and 110 miles during summer 1979 (USDI, NPS, 1980).

Pibal (pilot balloon) data collected for the Environmental Protection Agency (EPA) near Bonanza, Utah was used by Burns and McDonnell to determine atmospheric stability and wind direction at plume height. Pibals were released 1/2 hour after sunrise and at 2:00 p.m. Mountain Standard Time (MST) every other day from October 1976 to January 1978. Of the morning soundings, 14 percent were stable (F stability), 51 percent slightly stable (E stability), and 35 percent were neutral (D stability). (See Appendix 13 for definition of stability class.) Afternoon stability categories were: neutral, 85 percent; slightly stable, 13 percent; stable and unstable, 1 percent each.

The wind rose at plume height is shown in figure 3-1. The directions south-southeast clockwise through west-northwest comprised two-thirds of all plume level wind directions. Winds from the north and east occurred relatively infrequently. Wind speeds were mostly light, with wind speeds of 7.5 miles per hour (mph) (3.3 meters per second [m/s]) or less occurring during slightly more than half of the soundings (Burns and McDonnell, 1980a). It should be noted that the wind rose was constructed from data collected near the Bonanza site and would be expected to be less representative of plume level winds near the Rangely site.

TOPOGRAPHY

The Bonanza site would be located on a flat area at approximately 5,000 feet elevation.

The Rangely site, Deserado Mine, portal area, and refuse disposal area are at approximately 5,500 feet elevation and located on rolling topography dissected by washes. The area over the mine and at the railroad coal loadout and storage area is composed of rolling topography.

GEOLOGY-PALEONTOLOGY

The plant site and raw material supply systems lie within a low seismic risk zone. Hydrocarbons in a number of different forms are found throughout the Uinta Basin. Deposits of oil shale, petroleum, and natural gas are located under the Bonanza site. There are no known oil or gas reserves under the Rangely site.

Underlying the Rangely site, Deserado Mine refuse disposal area, and railroad coal storage and loadout area, nine coal seams have been identified in the lower 200 to 300 feet of the Williams Fork formation. The lithology of

TABLE 3-2

Paleontological Importance of Geologic Formations on Power Plant and Raw Material Supply System Alternative Sites[a]

Project Components	Geologic Formations: Uinta A (L)	Uinta B (M)	Alluvium (L)	Wasatch (L)	Mesa Verde Group (M)	Mancos Shale (L)	Green River (M)	Duchesne River (M)	Gravel Surface (L)	Morrison (H)	Sego Sandstone, Buck Tongue of Manco Shale, and Castlegate Sandstone (M)
Plant Site Alternatives											
Bonanza Site	--	--	1,840 ac.	--	--	--	--	--	--	--	--
Rangely Site	--	--	--	1,152 ac.	1,050 ac.	--	--	--	--	--	--
Coal Supply Alternatives											
Deserado Mine Portal Area	--	--	--	--	100 ac.	--	--	--	--	--	--
Refuse Disposal Area	--	--	--	--	609 ac.	--	--	--	--	--	--
Coal Transportation Alternatives											
Bonanza Alternative											
Electric Railroad											
Railroad Mainline	--	6 mi.	9 mi.	--	9 mi.	1 mi.	--	1 mi.	--	--	9 mi.
Coal Storage and Loadout Area	--	--	--	--	280 ac.	--	--	--	--	--	--
Coal Delivery Conveyor	--	--	--	--	3 mi.	--	--	--	--	--	--
Overland Conveyor	--	15 mi.	1 mi.	3 mi.	7 mi.	5 mi.	1 mi.	--	--	--	--
Slurry Pipeline	--	15 mi.	1 mi.	3 mi.	7 mi.	5 mi.	1 mi.	--	--	--	--
Off-Highway Truck	15 mi.	--	--	1 mi	--	--	1 mi.	--	--	--	--
Rangely Alternative											
Overland Conveyor	--	--	--	--	3 mi.	--	--	--	--	--	--
Off-Highway Truck	--	--	--	--	4 mi.	--	--	--	--	--	--
Water Source and Transport Alternatives											
Bonanza Alternative											
Green River Collection Well System and Pipeline	--	11 mi.	2 mi.	--	--	--	--	5 mi.	--	--	--
Utah White River Reservoir Pipeline	9 mi.	--	--	--	--	--	--	--	--	--	--
Rangely Alternatives											
Green River Collection Well System and Pipeline	--	--	2 mi.	1 mi.	10 mi.	12 mi.	--	--	9 mi.	1 mi.	5 mi.
Taylor Draw Reservoir	--	--	569 ac.	--	--	--	--	--	--	--	--
Taylor Draw Reservoir Pipeline	--	--	--	--	5 mi.	--	--	--	--	--	--
Wolf Creek Reservoir	--	--	1,808	--	--	--	--	--	--	--	--
Wolf Creek Reservoir Pipeline	--	--	--	4 mi.	3 mi.	--	--	--	--	--	1 mi.

[a]See Appendix 14 for further definition of importance ratings.

H = High probability of important fossil occurrence.
<u>High</u>: High number of high value fossils.

M = Moderate probability of important fossil occurrence.
<u>Moderate</u>: 1) Important fossils known from other sites in the formation.
2) Lack of data on which to base a rating.
3) Fossils scarce but important when found.

L = Low probability of important fossil occurrence.
<u>Low</u>: Low number of low value fossils.

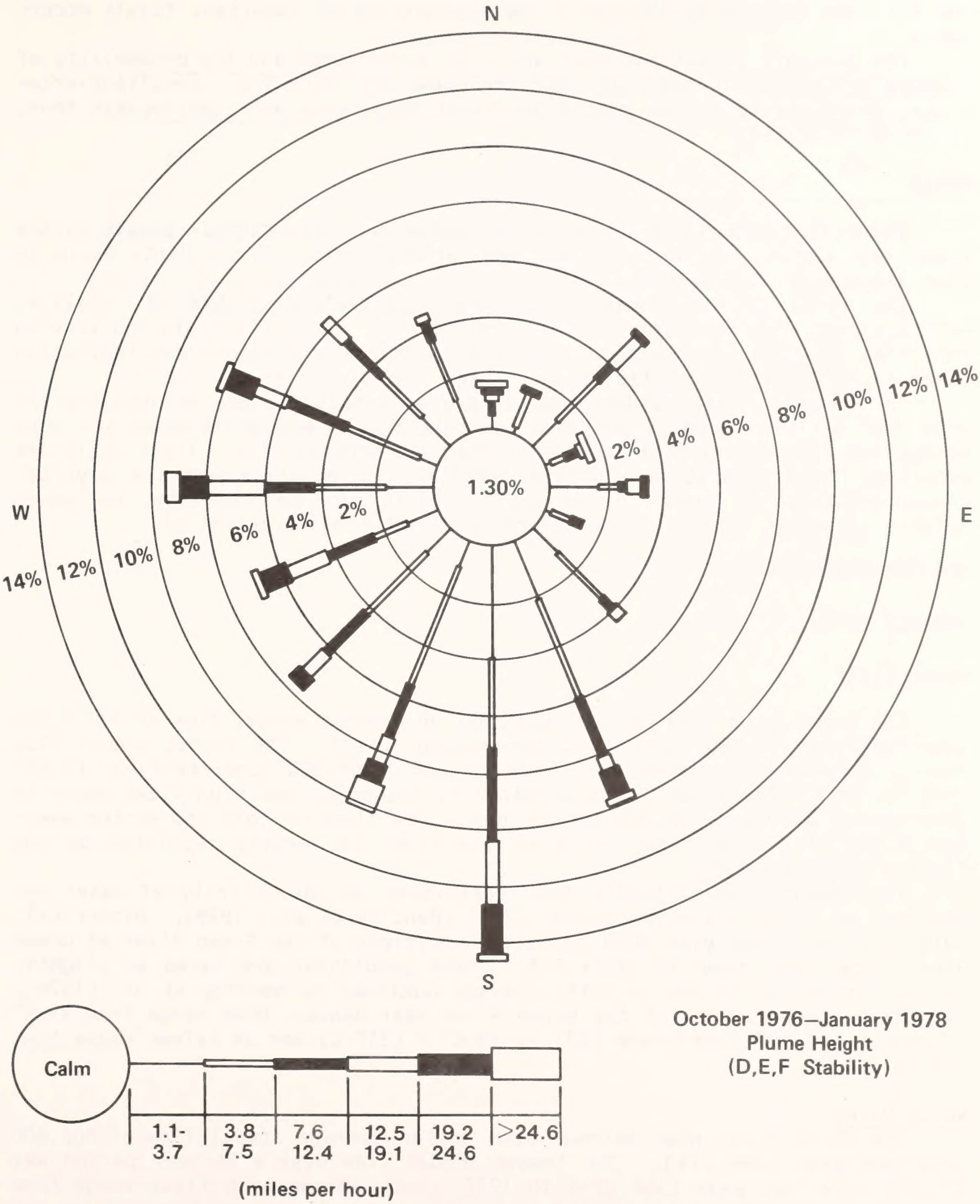


FIGURE 3-1

16 MONTH WIND ROSE U-A/U-B TRACT

the coal-bearing zone is predominantly siltstone, shale, carbonaceous shale and coal interbedded with thin, discontinuous, often calcareous sandstone. The Williams Fork formation has a low probability of important fossil occurrence.

The geologic formations that would be encountered and the probability of important fossil occurrence in each are shown in table 3-2. Fossils (vertebrate, invertebrate and/or plant) important to science and industry are found in these formations.

SOILS

The soil associations at the plant sites and raw material supply system areas are typical of the arid and semi-arid climates of the Uinta Basin in Utah and western Colorado.

The soils at the Bonanza site are relatively unproductive, shallow, well-drained, with moderate to slow permeability. Runoff is rapid and erosion potential is high. Productive top soil is relatively scarce and vegetation cover is difficult to reestablish.

The Rangely site and Deserado Mine area (including the refuse disposal area and railroad loadout and coal storage area) have soils that are more productive and support more vegetation than the Bonanza site. These soils are excellent for reclamation. Native fertility is moderate and the physical characteristics are good. These soils exhibit slow permeability, low water holding capacity, rapid surface runoff, and high erosion potential.

WATER RESOURCES

SURFACE WATER

Green River

The Green River near Jensen, Utah has an average annual flow of 3,157,000 acre-feet/year (4,360 cubic feet per second [cfs]). The lowest annual flow over a 33-year period (1903-04, 1946-78) was 1,055,000 acre-feet/year (1,457 cfs) in 1963. The river is rejuvenated by snowmelt, and high flows occur in late spring averaging 15,000 cfs in June. Low flows in fall and winter average 3,000 cfs. The flow regime of the river is largely regulated by the Flaming Gorge Reservoir.

The chemical constituents that contribute to the salinity of water are measured as total dissolved solids (TDS) (Bentley et al., 1978). Historical, 1976, and projected year 2000 salinity conditions of the Green River at Green River, Utah are shown in table 3-3. These conditions are rated as slightly saline, according to the salinity classes outlined by Bentley et al. (1978).

Water temperatures of the Green River near Jensen, Utah range from 33.8° Farenheit (F) (1° Centigrade [C]) to 69.8° F (21° C) and pH values range from 7.7 to 8.4.

White River

The White River near Watson, Utah has an average annual flow of 502,800 acre-feet/year (694 cfs). The lowest annual flow over a 55-year period was 223,200 acre-feet/year (308 cfs) in 1977. Late spring high flows range from 3,000 to 4,000 cfs and fall/winter low flows usually range from 200 to 350 cfs. The lowest recorded flow at the Utah-Colorado state line was 11 cfs in 1977 (Hansen, 1980c).

TABLE 3-3

Salinity Conditions of the Green River at Green River, Utah

Historical Level (mg/ℓ)[a]	1976 level (mg/ℓ)	Projected 1986 Level (mg/ℓ)	Projected 2000 Level (mg/ℓ)
457	464	512	519

Source: USDI, Water and Power Resources Service, 1979.

Note: These estimates do not include the Moon Lake project but give a baseline for impact analysis.

[a]Historic refers to the long-term average in general covering a period from 1941 to 1976. Where records for the entire period are not available, missing data were estimated by correlation with other sampling stations.

Approximately 37,000 acre-feet (51 cfs) of water are used consumptively each year for agricultural irrigation in the upper White River basin (Colorado Dept. of Natural Resources, 1979).

The historical and 1976 salinity condition of the White River near Watson are both slightly saline (445 milligrams per liter [mg/ℓ]).

Water temperatures near Watson range from 32.9° F (0.5° C) to 74.3° F (23.5° C) and pH values range from 7.3 to 8.5.

GROUND WATER

Bonanza Site

The quantity and quality of ground water near the Bonanza site are known mainly from data collected from oil wells. However, subsurface investigations conducted at the Bonanza site have revealed that only small quantities of water are in storage in the unconfined alluvium of Coyote and Kennedy Washes.

The Duchesne River (Tertiary) and Uinta (Cretaceous) formations, on which the Bonanza site partially lies, are relatively fine-grained, which inhibit the movement of water. Although some ground water may move through fractures in the sandstone, shales, and conglomerates of these formations, several vertical gilsonite seams retard ground water movement. Ground water in deeper-depth consolidated rocks is mainly brine, as is being produced in the Red Wash oil field.

In general, salinity of ground water sampled near the Utah oil shale tracts south of the Bonanza site range from 1,760 mg/ℓ to 4,030 mg/ℓ. The plant site is in the general vicinity of ground water supplies which have TDS concentrations greater than 3,000 mg/ℓ (Utah Department of Natural Resources, 1978). Concentrations above 2,000 mg/ℓ are considered to be highly saline (Bentley et al., 1978).

Rangely Site and Deserado Mine Area

The ground water resources of the White River basin near the Rangely site and Deserado Mine area are largely untapped at the present time. Consequently, there is a lack of knowledge concerning the extent and quality of ground water aquifers and ground/surface water relationships (Colorado Department of Natural Resources, 1979).

Aquifer testing was attempted on three test wells and selected observation wells at the Deserado Mine coal lease area (Hansen, 1979a). The results showed large drawdowns were obtained with very low pumping rates. Only one test gave a specific capacity in excess of one gallon per minute per foot of drawdown, the general lower limit of a low capacity well. TDS at this well was 3,240 mg/ℓ and some well samples ranged up to 7,110 mg/ℓ.

These studies all indicate that the ground water quantity is low and quality is poor.

The coal zone in the proposed Deserado Mine area is positioned between two sandstone formations, both of which contain tightly held ground water. These formations are not aquifers in the traditional sense of the word, because the ratio of available water to the amount that could be withdrawn is low.

The only surface water supplied by ground water in the area of potential impact is Cactus Reservoir. A water quality sample collected from Cactus Reservoir on the Rangely site, 1.5 miles east of the Deserado Mine boundary, was of relatively high quality with a TDS concentration of 188 mg/ℓ. At the

time the sample was collected, there were no surface inflows or outflows. The high water quality of the reservoir indicates that its supply is not connected with deeper ground water aquifers. The water in the reservoir is likely supplied by a perched aquifer which originates away from the Deserado Mine area on the slopes east of the Rangely plant site.

FLOODPLAINS AND WETLANDS

The only project component alternatives located within the floodplains of the Green and White Rivers are the Green River collection well system, Deserado Mine alluvial wells, and the White River Reservoir alternatives. Within the potential area of impact, the 100-year floodplain has not been defined but is estimated as being 50 feet on each side of the river. No wetlands have been identified in the project areas. Riparian areas are discussed in the Vegetation section. BLM Manual 6740, Wetland-Riparian Area Protection and Management considers wetlands and riparian areas as synonymous.

VEGETATION

VEGETATION TYPES

The major vegetation types in the potentially affected areas are grassland, sagebrush, sagebrush-grassland, mixed desert brush, greasewood, sagebrush-greasewood, shadscale, horsebrush-spiny hopsage, juniper, mountain brush and sand dune associations comprised of rabbitbrush, Indian ricegrass, and Russian thistle. These types are common in the Rocky Mountain West and can generally be collectively referred to as cold desert vegetation. These vegetation types characterize most of the Uinta Basin. Weedy annuals (i.e., African mustard, cheatgrass, plantago, etc.) may contribute from 8 to 45 percent of the vegetation cover (Allan, 1979). Vegetation types along coal transportation and water pipeline routes are shown in the environmental profiles, figures 3-8 through 3-10. Halogeton glomeratus, an introduced noxious weed, and Astragalus pubentissimus, a native "loco" weed, are common throughout the area. The most important vegetation types in the potentially affected areas are: (1) riparian which is limited in distribution to the streambanks and riverbanks, drainage areas, and banks of ponds; (2) artificially seeded areas that are important to livestock; (3) a small unique mountain brush community near the Rangely site.

RIPARIAN VEGETATION

Riparian communities located within alternative project sites are generally comprised of big sagebrush, greasewood, cottonwood, salt cedar, and willow. A 3-acre riparian community occurs around Cactus Reservoir on the south end of the Rangely site. Here, cottonwoods and willows line a marsh-bordered open water area. A riparian/greasewood community composed of old cottonwood, willows, reeds, rushes, sedges, grasses, and greasewood is found along the banks of the White River at the Taylor Draw and Wolf Creek Reservoir sites. The acreages within the alternative sites are shown in table 3-4.

ARTIFICIALLY SEEDED AREAS

Approximately 980 acres (38 percent) of the Rangely site is comprised of reseeded crested wheatgrass, western wheatgrass, needle-and-thread grass, bluegrass, cheatgrass, and a variety of annuals.

Table 3-4

Acreages of Riparian Vegetation on Project Components

Project Component	Bonanza Site Alternative	Rangely Site Alternative
Plant Site	82	80
Coal Supply Alternative		
Deserado Mine Area (including alluvial wells)	40	40
Refuse Disposal Area	80	80
Coal Transportation Alternatives[a]		
Electric Railroad		
Railroad Mainline	50	N/A
Coal Storage and Loadout Area	0	0
Coal Delivery Conveyor	Less than 1	Less than 1
Overland Conveyor	50	0
Slurry Pipeline	50	N/A
Off-highway Truck Haul	40	0
Water Source and Transport Alternatives		
Green River Pipeline[a] (including collection well system)	20	10
Utah White River Reservoir Pipeline[a]	105	16
Taylor Draw Reservoir	N/A	50
Taylor Draw Reservoir Pipeline[a]	N/A	Less than 1
Wolf Creek Reservoir[b]	N/A	863
Wolf Creek Reservoir Pipeline[a]	N/A	Less than 1

[a]Assumes 0.25 mile corridor.

[b]Riparian/greasewood association.

UNIQUE VEGETATION TYPES

A unique shrub community (4 acres) is located about 200 yards west of Red Wash along the alternative Rangely site access road. This community is composed of several mountain brush species which indicates a source of moisture, thus placing it in a different moisture regime than the surrounding area. Shrubs such as chokecherry, squawbush, serviceberry, mountain mahogany, wild rose, poison ivy, and Oregon grape are common in the crevices between the rocks. Several small box elder trees also occur here; these are normally streamside canyon trees. A streamside-type grass, Elymus cinereus, and a riparian shrub, Chrysothamnus linifolius, are also present. This is a unique island-like community in a desert environment.

THREATENED AND ENDANGERED PLANT SPECIES

A total of ten plant species that are candidate (listed in the July 1, 1975 and June 16, 1976 Federal Registers) and one officially listed (listed in Federal Register on October 11, 1979) are within the areas of the proposed and alternative project sites. (See Appendix 15 for current status of threatened and endangered plants.) The Uinta Basin hookless cactus (Sclerocactus glaucus), which is officially listed as threatened by the U.S. Fish and Wildlife Service (USFWS), is known to occur in eight sites in western Colorado and eastern Utah. The estimated population is about 15,000 individual plants (USDI, USFWS, 1980). During field investigations of potential project sites by Welsh and Neese (1979), a single plant was found along the Green River to Bonanza site water pipeline route. The main population centers of this species are west of the potential Moon Lake project area (Welsh and Neese, 1979).

The project sites which are known to be habitat for candidate threatened or endangered plant species are the Bonanza site, Rangely site, Green River to Bonanza site water pipeline route, and the Deserado Mine to Bonanza site railroad, overland coal conveyor and slurry pipeline routes (Welsh and Neese, 1979). The species occurring in these areas and their status are listed in table 3-5. No surveys have been conducted specifically for the Taylor Draw or Wolf Creek Reservoir areas. Any of the species listed in table 3-5 with the exception of Ephedra buckwheat (Eriogonum ephedriodes), Uinta hermidium (Hermidium alpes), and Graham beardtongue (Penstemon grahamii) could potentially be found at either reservoir site.

ANIMAL LIFE

TERESTRIAL

Species of concern which are found within the potential impact area and which could be adversely affected are: mule deer, antelope, sage grouse, bald eagles, whooping cranes, golden eagles, wild horses, and raptor species such as the ferruginous hawk, burrowing owl, red-tailed hawk, and great horned owl.

Mule Deer

Mule deer are a big game species found throughout the area of potential impact (see figure 3-2). Deer are yearlong residents in the riparian zones 8 miles south of the Bonanza site area but utilize the area of the plant site very little. In the area of the Rangely site, some deer are yearlong residents and others are migrants which utilize the area primarily during the

TABLE 3-5

Known Occurrence of Candidate Threatened or Endangered Plants on Project Components

Project Components	Bonanza Site Alternative		Rangely Site Alternative	
Plant Site	ASDU	9 sites	ASDE	2 sites
Coal Transportation Alternatives				
Overland Conveyor and Slurry Pipeline	ASDE	1 sites		0
	ASDU	3		0
	CYDU	1		0
	EREP	2		0
	HEALP	1		0
	PALI	1		0
	PEGR	1		0
Electric Railroad Mainline	EREP	1		N/A
Water Source and Transport Alternative				
Green River Pipelines (including collection well system)	ASDU	2 sites		0
	ASSA	1		0
	CRBR	2		0
	CYDU	1		0
	ERVI	14		0

Note:

	Status: Pre Nov. 1979	Status: Post Nov. 1979
ASDE = *Astragalus detritalis*	Threatened	Rec. for delisting
ASDU = *Astragalus duchesnensis*	Threatened	Rec. for delisting
ASSA = *Astragalus saurinus*	Threatened	Threatened
CRBR = *Cryptantha breviflora*	Endangered	Rec. for delisting
CYDU = *Cymopteris duchesnensis*	Threatened	Rec. for delisting
EREP = *Eriogonum ephedroides*	Threatened	Threatened
ERVI = *Eriogonum viridulum*	Threatened	Rec. for delisting
HEALP = *Hermidium alipes* v. *pallidium*	Endangered	Rec. for delisting
PALI = *Parthenium ligulatum*	Threatened	Rec. for delisting
PEGR = *Penstemon grahamii*	Endangered	Endangered

Number of sites potentially affected as shown on field maps by Welsh and Neese, 1979. No survey has been conducted for the Taylor Draw or Wolf Creek Reservoirs. Any of the species listed on this table potentially could grow within the reservoir areas with the exception of EREP, HEALP, and PEGR.

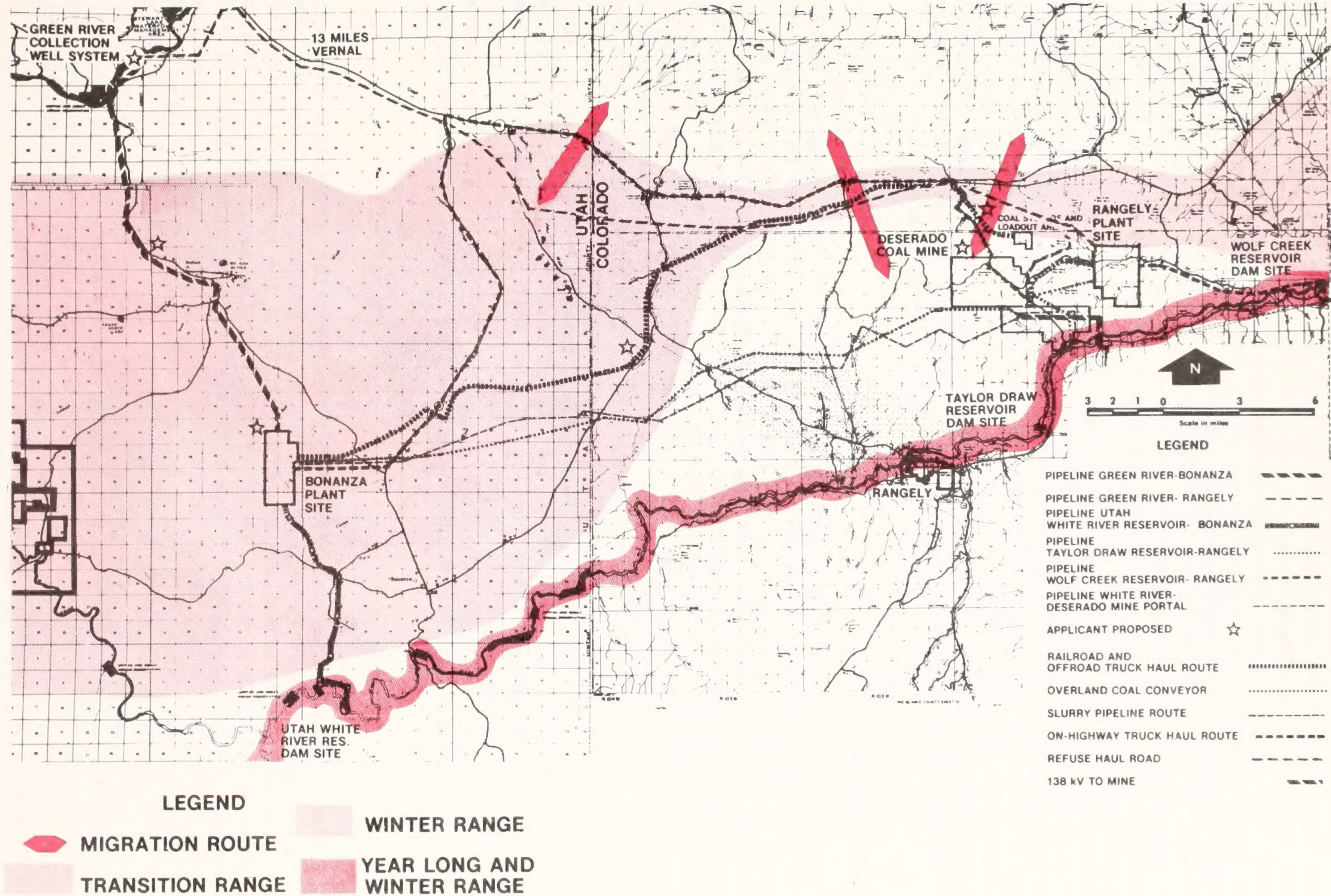


FIGURE 3-2

MULE DEER HABITAT ON POWER PLANT AND RAW MATERIAL SUPPLY SYSTEM ALTERNATIVE SITES

winter. Utilization of this plant site is minimal. This is also true of the Deserado Mine area where densities range from 0.8 per square mile yearlong to 1.43 per square mile during winter.

Mule deer are present in small numbers yearlong, and in slightly increased numbers (see above) during winter along the railroad, conveyor, slurry pipeline, truck haul, and water pipeline routes. There are three known migration routes in the area as shown in figure 3-2. Approximately 200+ deer are killed annually in vehicle collisions on the 25 miles of Highway 40 between the Utah-Colorado border and Masadona, Colorado, primarily during spring and fall migration seasons (Vidakovich, 1980).

Densities in the Taylor Draw Reservoir area also range from 0.8 per square mile yearlong to 1.43 per square mile during winter. Densities in the Wolf Creek Reservoir area range from 54-80 per square mile during winter. There is a mule deer migration route near the eastern end of the proposed Wolf Creek Reservoir (Gettman, 1980).

Approximately 585 acres of critical mule deer winter range have been identified within the area that could be inundated by the Wolf Creek Reservoir.

Pronghorn Antelope

Pronghorn antelope are big game animals found in the potential impact area in Colorado and Utah. One herd of about 200 to 250 antelope ranges in Utah with a crucial fawning area of approximately 38,000 acres around the Bonanza site. Even though the antelope herd has been in existence 26 years, its population is presently static to declining. Lack of permanent water sources is thought to be a limiting factor for the Bonanza herd. The aerial trend count has fluctuated between 118 to 184 animals with a current figure of 133 (Utah Division of Wildlife Resources [UDWR], 1978). Any losses added to a herd which is apparently surviving in a marginal situation could eliminate the herd. A herd of up to 500 antelope in Colorado migrates during summer months into the vicinity of the Rangely site, the proposed railroad route, coal storage and loadout area, the off-highway truck haul route, the coal refuse disposal area, and the northern portion of the Wolf Creek Reservoir. The relationship of antelope habitat to the power plant and raw material supply system alternative sites is summarized in table 3-6 and is shown in figure 3-3. Cactus Reservoir, an important summer watering source, is located on the Rangely plant site.

Sage Grouse

All plant site and raw material supply system sites are within historic sage grouse range. Presently sage grouse are found primarily in Colorado. No data is available on the densities of this species in the potentially affected areas. However, sage grouse are known to frequent the areas shown in figure 3-4 and quantified in table 3-7. One of these "concentration" areas is located on the Rangely site. Other concentration areas would be crossed by 4 miles of the proposed Bonanza railroad and off-highway truck haul routes and 4 miles of the Green River to Rangely water pipeline. Sage grouse are also present in the proposed coal mine refuse disposal area which covers 609 acres.

The importance of concentration areas to the survival of sage grouse in areas which could be affected by the project is not documented but no leks (strutting grounds) which are necessary for sage grouse reproduction are located in any of the possible impact areas.

TABLE 3-6

Pronghorn Antelope on Power Plant and
Raw Material Supply Systems Alternative Sites

Component	Bonanza Site	Rangely Site
Plant Site	1,840 ac.	2,202 ac.
Coal Supply		
Deserado Mine	--	--
Portal Area	--	--
Refuse Disposal Area	609 ac.	609 ac.
Coal Transport		
Electric Railroad		
Railroad Mainline	--	N/A
Coal Storage and Loadout Area	--	N/A
Coal Delivery Conveyor	--	N/A
Overland Conveyor	11 mi.	--
On-Highway Truck	--	--
Off-Highway Truck	22.5 mi.	--
Slurry Pipeline	11 mi.	1 mi.
Water Source and Transport Alternative		
Green River Pipelines	17 mi.	16 mi.
Utah White River Reservoir Pipeline	7 mi.	N/A
Taylor Draw Reservoir	N/A	--
Taylor Draw Reservoir Pipeline	N/A	--
Wolf Creek Reservoir	N/A	--
Wolf Creek Reservoir Pipeline	N/A	0.4 mi.

TABLE 3-7

Sage Grouse on Power Plant and
Raw Material Supply System Alternative Sites

Component	Bonanza Site	Rangely Site
Plant Site	--	2,202 ac.
Coal Supply		
Deserado Mine	--	--
Portal Area	--	--
Refuse Disposal Area	609 ac.	609 ac.
Coal Transport		
Electric Railroad		
Railroad Mainline	4 mi.	N/A
Coal Storage and Loadout Area	--	N/A
Coal Delivery Conveyor	--	N/A
Overland Conveyor	--	--
On-Highway Truck	--	--
Off-Highway Truck	4 mi.	0.5 mi.
Slurry Pipeline	--	N/A
Water Source and Transport Alternative		
Green River Pipelines	--	4 mi.
Utah White River Reservoir Pipeline	--	N/A
Taylor Draw Reservoir	N/A	--
Taylor Draw Reservoir Pipeline	N/A	--
Wolf Creek Reservoir	N/A	--
Wolf Creek Reservoir Pipeline	N/A	0.5 mi.

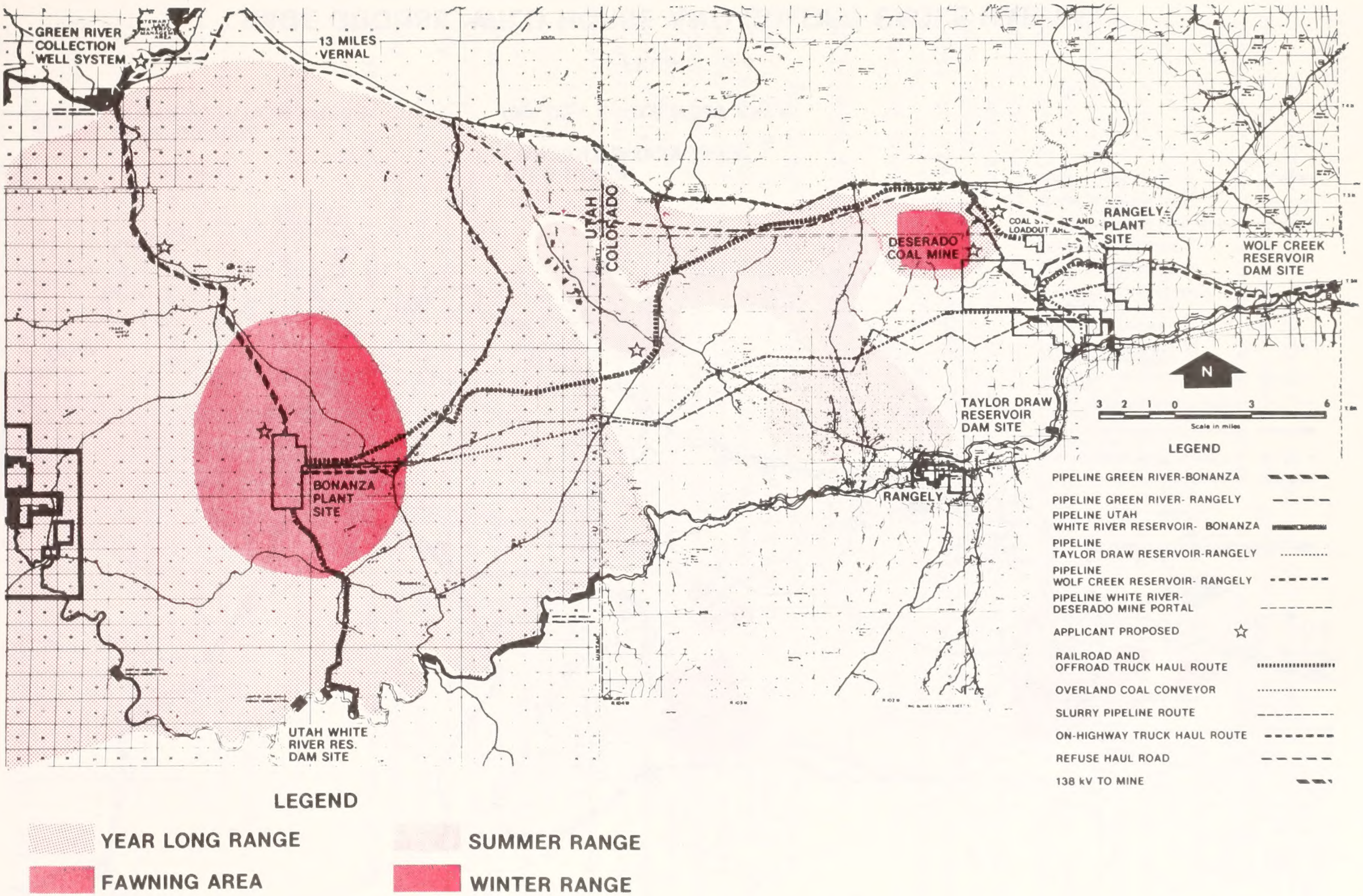


FIGURE 3-3

ANTELOPE HABITAT ON POWER PLANT AND RAW MATERIAL SUPPLY SYSTEM ALTERNATE SITES

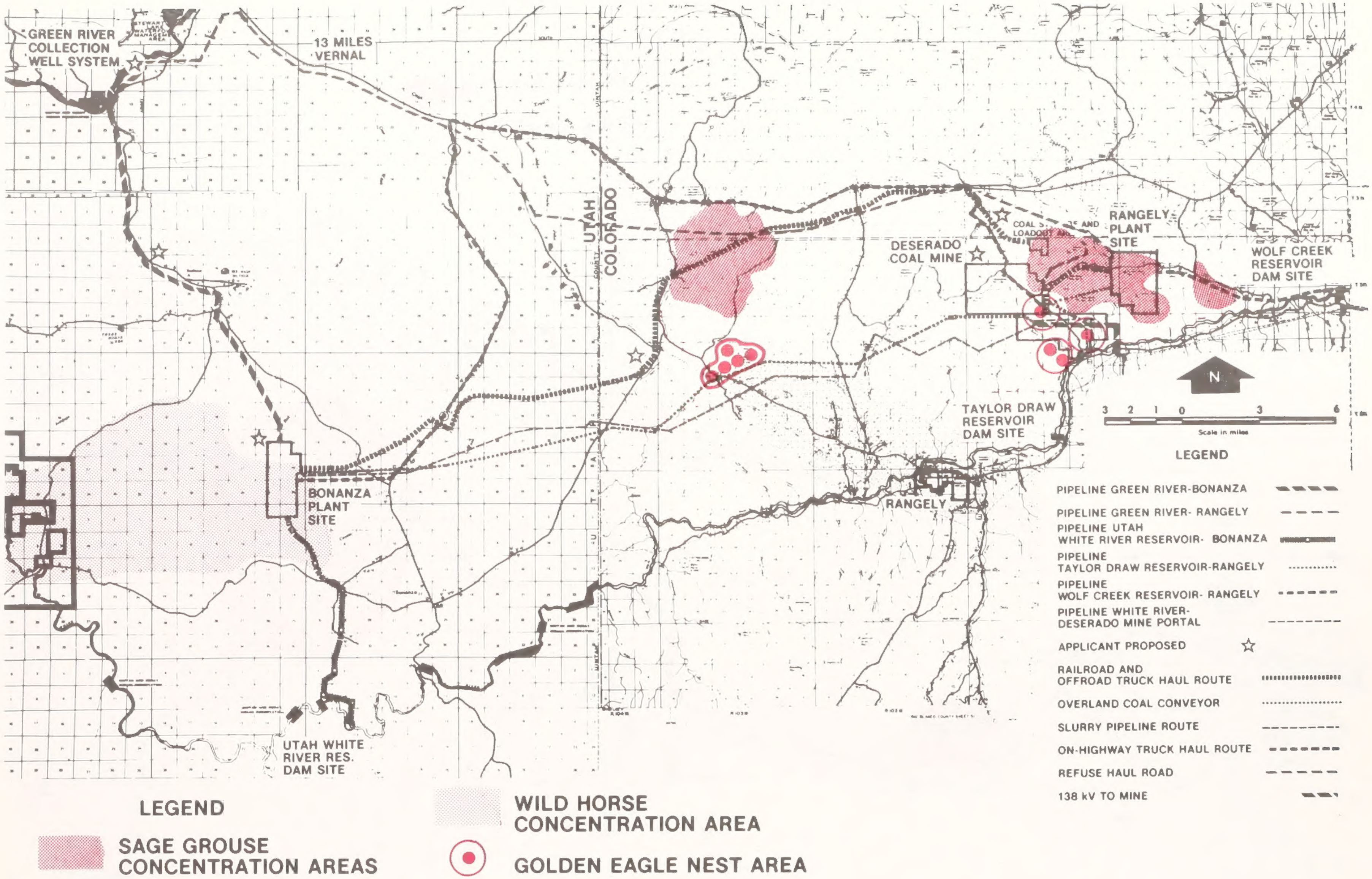


FIGURE 3-4

SAGE GROUSE, WILD HORSE AND GOLDEN EAGLE HABITAT ON POWER PLANT AND RAW MATERIAL SUPPLY SYSTEM ALTERNATIVE SITES

Raptors

Predatory birds (raptors), including golden eagles, ferruginous hawks, burrowing owls, red-tailed hawks, and great horned owls, are well represented throughout the potential impact areas. All raptors are protected by Federal laws.

Golden eagles are common yearlong residents within the potential impact area of Colorado. Nests which have been active within the past 3 years are also fairly common. One active nest site is located within 0.25 mile of the mine portal area, one on a ledge overlooking the Taylor Draw Reservoir, and another near the site of the Wolf Creek Reservoir (figure 3-4).

Other raptor nests include a ferruginous hawk nest located immediately south of milepost 4 of the Deserado to Bonanza railroad or off-highway truck route and a burrowing owl nest on the Rangely site.

There are also two red-tailed hawk nests within 0.5 mile of the Deserado Mine refuse disposal area and two others are within 0.25 mile of the coal route to the Rangely site. Two great horned owl nest sites have been reported, one 0.5-mile from the mine portal area and one within 0.5 mile of the overland conveyor to the Rangely site.

Threatened and Endangered Species

The Green River including adjacent marshes or water bodies (e.g., Stewart Lake, Ouray National Waterfowl Refuge) is the only major stopping area along the migration route of the endangered whooping cranes from the Grays Lake foster parent program. This program has successfully reared a small flock of approximately 20 whooping cranes. Twice yearly, these birds migrate, with their greater sandhill crane foster parents, from Grays Lake, Idaho to the San Luis Valley of Colorado (Drewein, 1980). Their migration route includes the project area but the extent of use (if any) on the White River at the Taylor Draw or Wolf Creek Reservoir sites is unknown.

Bald eagles (endangered) winter mainly along the White River, including roost areas near the upper end of the Wolf Creek Reservoir site, but may range into the project areas. Although considered to be primarily fish eaters and usually seen around water, they are commonly seen far from water, feeding on carrion. Peregrine falcons (endangered) are known to exist in Dinosaur, and may occasionally range into the project area.

The black-footed ferret (endangered) probably existed historically within the project areas. However, no reports have been authenticated for more than 10 years and it is not likely that the ferret now exists on any of the project sites (Smith et al., 1979).

Wild and Free Roaming Horses

A herd of 30 to 40 wild horses range sporadically in an area of approximately 27,560 acres which includes approximately 1,700 acres of the Bonanza site (see figure 3-4). They spend approximately 6 percent of their time in the area of the Bonanza site.

AQUATIC

Green River

The potential area of impact on the Green River would be downstream of the Walker Hollow collector well system.

Endangered, rare, game, and non-game species have been captured during five studies conducted from 1967 to 1979.

Threatened and Endangered Species, Game Fish, and Non-Game Fish

The endangered species inhabiting the river include: Colorado squawfish, humpback chub, and bonytail chub. The razorback sucker was proposed as threatened but is no longer considered a proposed threatened species by the USFWS. It is rare and is still protected by the States of Utah and Colorado. Colorado squawfish (Ptychochelius lucius) inhabit and reproduce in the Green River (Holden and Selby, 1979a). During Holden's investigations, 1,288 young, 256 juveniles, and 22 adults were captured which substantiates reproduction. Evidence from investigations also suggests that the squawfish and the bonytail chub have a minimum flow requirement below which reproductive success is very poor. There is not sufficient information available to indicate that the humpback chub or razorback sucker have suffered from flow depletion. Therefore, "the actual causitive agent of declines, such as water volume, water velocity, available habitat, or altered temperature regime, is not known" (Holden and Selby, 1979a). Seethaler (1978) believes a major threat to these fish, besides altered flow patterns and loss of habitat, is competition with exotic fish species. Therefore, the influence of important limiting factors such as low flows for these rare fish is not completely known.

Nine game fish species have been captured during investigations on the Green River. Of these, only the channel catfish has been commonly found. It is the only game species reproducing in the portion of the river that would be affected (Holden and Selby, 1979a).

The exotic red shiner is the most abundant non-game fish in the river. Carp and fathead minnows are also commonly found. These three species comprise nearly 74 percent of the total catch of five studies.

White River

The section of the White River that could be affected due to water withdrawal begins approximately 19 miles northeast of Rangely, Colorado and terminates at the confluence with the Green River near Ouray, Utah.

Investigators have captured 18 species of fish. Nine are considered native of which three are endangered and one is rare.

As with the Green River, important habitat components for fish are temperature, substrate, and flow (Holden and Selby, 1979b).

Threatened and Endangered Species, Game Fish, and Non-Game Fish

The three endangered species in the White River are the Colorado squawfish (Ptychocheilus lucius), the humpback chub (Gila cypha), and the bonytail chub (Gila elegans); and one formerly proposed threatened species, the razorback sucker (Xyrauchen texanus).

Colorado squawfish inhabit the White River in small populations. The squawfish gain access to the White River from the Green River and tend to remain near the mouth of the White River (Lanigan et al., 1979). The presence of young squawfish near Piceance Creek may indicate that they are using that area for spawning (USDI, BLM, 1980). Because squawfish apparently move considerable distances up tributaries, they use the affected area for only short periods of time (Holden and Selby, 1979b).

Two studies reported the presence of the humpback chub in the White River (Sigler and Miller, 1963 and Lanigan et al., 1979). Two hybrids of the humpback chub complex have been reported downstream of the mouth of Scullion Gulch (Lanigan et al., 1979).

Bonytail chubs have not been definitely identified in the White River (USDI, BLM, 1980). Lanigan et al. (1979) identified a fish taken in the lower White River as a bonytail, but it may have been a cross between a bonytail and a humpback (Holden and Selby, 1979a).

Sigler and Miller (1963) reported razorback suckers in the White River near Ouray. These fish may occasionally enter the White River from the Green River.

The White River has limited value as a sport fishery. Only six game species have been captured in the areas that would be affected. The abundance of all these fish is less than 1.0 percent of the total catch, and reproducing populations of these species are probably non-existent in the White River.

The most abundant non-game fish species collected were the red shiner, speckled dace, and flannelmouth sucker. These three species comprise almost 75 percent of the total reported collections. The exotic red shiner makes up 42.1 percent of the total. This species dominates the lower river section where the river bottom is a sand-silt substrate and the flows are slower (Holden and Selby, 1979b).

CULTURAL RESOURCES

Northeastern Utah and adjacent northwestern Colorado have been the scene of fairly continuous human occupation for the past 12,000 years. The results of archaeological survey and excavation have indicated the presence of nomadic Paleo Indians (10,000-12,000 years ago), Archaic hunters and gatherers (ca. 2250 B.C.-A.D. 350), and agricultural Fremont Indians (ca. A.D. 950-1200). Written records provide accounts of historic Ute, Shoshoni, and historic Euro-American activity in the area.

One hundred and eighteen prehistoric and historic cultural resource sites have been recorded in areas that would be subject to ground-disturbing activities. None of these are currently listed in the National Register of Historic Places, although five appear to be eligible for nomination. Five additional sites require some form of subsurface testing before any statement as to their significance can be made. All of the sites were found in open areas. Four basic types were defined: (1) lithic scatters made up mainly of chipped stone artifacts representing limited use; (2) prehistoric campsites containing materials indicative of short-term human occupation; (3) habitation sites containing structures suitable for prolonged residence; and (4) Euro-American campsites characterized by clusters of historic debris. The majority of sites recorded were lithic scatters and prehistoric campsites. A listing of sites by project component is found in table 3-8.

VISUAL RESOURCES AND RECREATION

VISUAL RESOURCES

Although the visual resource evaluation and management procedures of the BLM and the USFS differ somewhat, the objectives of both agencies are to classify visual resources according to their inherent scenic quality. The number of people who see them and their attitudes toward alteration of the landscape, their distance from viewers, and the existing man-made intrusions

TABLE 3-8

Occurrence of Cultural Resources
Power Plant and Raw Material Supply System Alternatives[a]

Project Component	Bonanza Site Alternative		Rangely Site Alternative	
	Sites	Eligible	Sites	Eligible
Plant Site	8	0	21	1
Coal Supply Alternative				
Deserado Mine (subsidence area)	43	4	43	4
Refuse Disposal Area	4	0	4	0
Coal Transportation Alternatives				
Electric Railroad			N/A	
Railroad Main Line	9	0		
Coal Storage and Loadout Area	5	0		
Coal Delivery Conveyor	2	1		
Overland Conveyor	21	0	1	0
Slurry Pipeline	9	0	N/A	
Off-Highway Truck Haul Route	7	0	N/A	
Water Source and Transport Alternative				
Green River Pipeline (including collection well System)	2	0	1	0
Utah White River Reservoir Pipeline	3	1	N/A	
Taylor Draw Reservoir	N/A		2	2
Taylor Draw Reservoir Pipeline	N/A		0	
Wolf Creek Reservoir	N/A		2	2
Wolf Creek Reservoir Pipeline	N/A		No data.	

[a]Due to the overlap of various project alternatives, sites recorded on one alternative may also appear on another. Therefore, the sites listed in this table cannot be added together for a total. Only 118 sites were recorded, 5 of which appear to be eligible for nomination to the National Register. For management purposes, an additional five sites need subsurface testing for an eligibility determination but are listed on the table as eligible.

present. Based on this evaluation, areas are assigned management classes. Management guidelines for each class are designed to maintain or enhance the visual quality of the area (see Appendix 16 for definition of terms and management classes).

The Bonanza site is located within a flat natural-appearing desert valley. The plant site would be located in a Visual Resource Management (VRM) Class IV area comprised of Class C (low quality) scenery, medium sensitivity, and a middleground visual zone. Scenic quality is based on existing form, line, color, and texture. (See Appendix 16 for definition of terms.) The location is visible from areas along Utah Highway 45 which has an average daily traffic (ADT) of 280 vehicles. A new paved county road is under construction and will pass about 3 miles north of the plant site. The plant site is in the middleground visual zone from this road.

The Rangely site is in the foreground visual zone of the Staley-Gordon Mine road. The Deserado Mine portal and refuse disposal area would be located in a VRM Class IV area comprised of Class C scenery, medium sensitivity, and in a middleground visual zone. The site is within a flat, undisturbed desert valley and is not visible from adjacent highways. The Deserado Mine portal would be located in a rolling to moderately steep drainage. The ventilation entry would be at the lower end of the same drainage on a site which has already been disturbed by coal development. The refuse disposal and storage and loadout area would be located on natural-appearing rolling topography that is visible (foreground) from the Staley-Gordon Mine road. The Taylor Draw and Wolf Creek Reservoir sites are in a VRM Class II area along the White River. The foothills surrounding the river bottom are in a Class IV area.

Visual resource information (including VRM classes, scenic quality, sensitivity, and visual zones) for the areas that would be crossed by routes for coal transportation and water supply pipelines is shown in figures 3-8 through 3-10 at the end of this chapter. Potentially affected highways and ADT totals are shown in table 3-9.

RECREATION

There are no developed recreation facilities or intensive recreation uses of the power plant or raw material supply system sites. There is a small unquantified amount of off-road vehicle (ORV) use of the area traversed by the Deserado Mine to Bonanza site coal transportation alternatives.

In Utah, both the Green and White Rivers receive a small amount of recreational boating use (under 200 people per year) along the segments from which water could be taken. Recreational use of the White River in Colorado is extremely limited because of current Colorado trespass law which requires boaters to obtain permission from all private landowners along the river.

LAND USE

URBAN USE

Vernal and Rangely are the communities most likely to be affected by the Moon Lake project. Presently, there are 400-500 acres of open land existing in Vernal. In addition, Vernal lies contiguous to an area generally referred to as Ashley Valley which has a potential of 23,360 acres available for additional housing, streets, and associated community services. The Uintah School District has purchased three sites for additional schools.

TABLE 3-9

Average Daily Traffic (ADT) on Affected Highways

Project Component	Bonanza Site Alternatives Highway	Milepost	ADT	Rangely Site Alternatives Highway	Milepost	ADT
Railroad and Off-Highway Truck Haul Route	US 40	3-10	775	N/A	N/A	N/A
	Col 64	16-20	950	N/A	N/A	N/A
	Utah 45	28	280	N/A	N/A	N/A
Coal Conveyor	Col 64	13	2,000	0	0	0
	Utah 45	27	280	0	0	0
Slurry pipeline	Col 64	13	2,000	N/A	N/A	N/A
	Utah 45	27	280	N/A	N/A	N/A
Green River Water Pipelines	0	0	0	Col 64	18	2,000
				Utah 45	26	265

Source: Utah and Colorado Highway Departments. Data for 1978.

In Rangely, there are presently 162 acres of open land. Also, since 1975, Rangely has maintained a pending public sale application with the BLM for approximately 2,500 urban development acres in order to better accommodate energy-related growth.

The Rio Blanco County School District (RE-4) facilities are being used at approximately 46 percent of capacity.

AGRICULTURE

Traditionally, agriculture and ranching have been the economic mainstay in Rio Blanco and Uintah Counties, and have caused the settlements there. Since about 1970, however, non-agricultural industries, primarily petroleum exploration and production, mining, and tourism, have experienced substantial growth. During the same period, the agrarian section of the economy has declined in importance, despite recent increases in income and production.

Three percent of the total land area in Uintah County is cropland, of which 96 percent (83,435 acres) is irrigated. In Rio Blanco County, 1.6 percent of total land area is cropland, of which 44 percent (16,000 acres) is irrigated. The principal crops of these two counties are hay and small grains.

The Soil Conservation Service (SCS) has determined that prime cropland does not generally exist in Uintah County, with the exception of land along the Green River that has water rights (Anderson, 1979). In Rio Blanco County, prime cropland of designated national importance and lands classified as of statewide importance border the White River. These are generally located on alluvial soils. Appendix 17 contains the SCS definitions of these land categories. Approximately 4,000 acres of irrigated land, not prime by SCS standards, are along the White River in the upper White River basin in Colorado. Immediately east and west from Rangely, along the White River, are approximately 2,600 acres of prime (irrigated) farmlands of national importance (SCS standards).

The area that would be inundated by the Taylor Draw Reservoir currently produces 4 tons per acre of alfalfa or 1.66 tons per acre of meadow hay.

The area that would be inundated by the Wolf Creek Reservoir currently produces 4 tons per acre of alfalfa, 1.66 tons per acre of meadow hay, 80 bushels per acre of oats, or 53 bushels per acre of barley (ACS, 1980). The area also produces about 5,000 lbs. of honey annually (Herron, 1980).

GRAZING

Most of the land in Uintah and Rio Blanco Counties is used for rangeland, with less than 17 and 9 percent used for cropland, respectively. There are approximately 2,418,510 pasture and range acres in Uintah County (83 percent of total land area) and 1,999,317 pasture and range acres in Rio Blanco County (91 percent of total land area). Cattle represent the area's largest value of livestock. The 1973 census for Rio Blanco County records 37,000 cattle and 93,000 sheep. Comparable 1978 data for Uintah County show 49,042 cattle and 25,381 sheep.

The power plant sites and raw material supply system alternatives would be located on BLM land presently alloted to sheep grazing. Grazing allotments in project areas are tabulated in table 3-10.

TABLE 3-10

Grazing Allotments

Project Component	Allotment	Total Vegetation Allocation (AUMs)[a]	Bonanza Site AUMs in Project Area	Rangely Site AUMs in Project Area
Plant Site	Red Wash	447	N/A	94
	Hall Draw	448	N/A	18
	Antelope Draw	6,707	99	N/A
	Bonanza	2,434	51	N/A
Mine Portal Area	Spooky Mountain	1,480	46	46
Refuse Disposal Area	Red Wash	447	38	38
Coal Storage and Loadout Area	Spooky Mountain	1,480	9	9
	Red Wash	447	4	4
Wolf Creek Reservoir	Coal Reef	359	N/A	23
	Horse Draw	1,518	N/A	32
	Lower Coal Creek	816	N/A	69
	Greasewood	1,727	N/A	22
	Little Spring Creek	1,181	N/A	21
Taylor Draw Reservoir	Spooky Mountain	1,480	N/A	4
	Lower Fletcher Draw	6,041	N/A	2

[a]An animal unit month (AUM) is equivalent to 800 pounds of air dry forage which would support about five sheep for 1 month.

TRANSPORTATION

The major transportation artery of the Uinta Basin is U.S. Highway 40. Running east and west, this highway connects directly with Vernal and passes approximately 18 miles north of Rangely. ADT volume of U.S. Highway 40, from the junction of Utah State Highway 45 to the Colorado state line, is 1,470 vehicles, but in Colorado, directly north of Rangely, decreases to 770 vehicles.

Utah State Highway 45 passes 2.75 miles east of the Bonanza site and extends south to Bonanza from its junction with U.S. Highway 40. ADT volume of Utah State Highway 45 is 280 vehicles (Utah Department of Transportation, 1980).

The Rangely site is situated between U.S Highway 40 and Colorado State Highway 64. Both highways are less than 5 miles from the Rangely site; a graveled road extends from each highway to the site. Colorado State Highway 64 passes through the Town of Rangely. ADT volume east of town is 1,650 vehicles and west of town is 3,000 vehicles (Colorado Department of Highways, 1980a).

No railroads exist in Uintah County and western Rio Blanco County.

MINERALS

The Bonanza site lies within the eastern Uinta Basin Federal oil shale withdrawal area, but is outside important yield deposits. Regional active oil shale operations, the TOSCO Sand Wash project, and the White River Shale project (Tracts U-a and U-b) are located approximately 6 miles and 9 miles respectively southwest from the Bonanza site (Uinta Basin Association of Governments and Utah Energy Office, 1979).

The Bonanza site contains six different oil and gas leases which are a part of the Sand Ridge II Unit Agreement, a known producing area. There is one producing well on the site. There is no evidence of past mining claim activity on the Bonanza site and no evidence of mineral deposits was found through a literature search.

The Rangely site contains nine different oil and gas leases. The coal storage and loadout area does not contain active oil and gas leases. The mineral leases and their areas on the project sites are listed in table 3-11.

LAND USE PLANS AND CONTROLS

The power plant and raw material supply system sites would be within the area managed under the BLM White River Management Framework Plan (1978), controlling public lands in Rio Blanco County, and the Bonanza Management Framework Plan (1974), controlling public lands in Uintah County.

Both Vernal City and Uintah County have zoning ordinances (1971). Vernal is currently in the process of developing a land use master plan. The Uinta Basin Association of Governments has prepared the Uinta Basin Development Plan (1979), which covers Uintah County. Rio Blanco County has a zoning ordinance (1978), as does the Town of Rangely (1977). Rio Blanco County and Rangely both have land use master plans (1976). Generally, city ordinances are more stringent in land use control than are county ordinances.

The Bonanza site and raw material supply systems would be located in areas now zoned for mining and grazing. The Rangely site, raw material supply system, Deserado Mine, and the Taylor Draw and Wolf Creek Reservoirs would be located in areas now zoned for agriculture. Mining could occur under this zoning.

TABLE 3-11

Mineral Leases on the Power Plant and Raw Material Supply System Alternative Sites[a]

Bonanza Site		Rangely Site		Refuse Disposal Area		Taylor Draw Reservoir Site		Wolf Creek Reservoir Site	
Number	Acres on Site	Number	Acres on Site	Number	Acres on Site	Number	Acres on Site	Number	Acres on Site
U-29328	72.15	C-14598	231	C-15433	600	C-3823	10	C-21424	175
U-13646	320.00	C-14597a	285			C-26206	30	C-14245a	122
U-0143282a	280.00	C-14509	640			C-9764	30	C-12026	2
U-29327	40.00	C-18437	120					C-15997	6
U-7386	400.00	C-14597	646					C-19713	3
U-0143284	320.00	C-18256	40					C-0695	8
		C-25644	40					C-011902	12
		C-25646	160					CR-205084	56
		C-14533	40					CR-699856	22
								CR-488428	5
								CW-E07/7/1910	448

[a]U and C numbers are oil and gas leases, CR numbers are patented coal reserve areas, and CW is a coal withdrawal area.

SOCIOECONOMICS

The population centers that would be affected most by the Moon Lake project are Vernal in Uintah County and Rangely in Rio Blanco County. This section discusses the existing socioeconomic situation in each area.

Uintah County's economy is based primarily on petroleum, gilsonite, phosphate, and forest products. Other industries include tourism, farming, and ranching.

Rio Blanco County's economy is based primarily on the production of crude petroleum and natural gas, ranching, forestry, and farming. It is the largest oil producing county in Colorado.

POPULATION

Uintah County, Utah

The population of Uintah County has grown steadily from 12,684 in 1970 to about 20,479 in 1980, an increase of 61.5 percent. This increase is due primarily to energy industry expansion throughout the 1970s and represents a compound annual growth rate of 4.3 percent. The approximate population for Vernal in 1980 was 6,600.

Rio Blanco County, Colorado

As a result of energy-related expansion throughout the 1970s, the population has increased steadily. Rio Blanco County's estimated 1980 population was 6,249 people, or a 29.1-percent increase since 1970. This represents a compound annual growth rate of 1.8 percent. Rangely's 1980 population was about 2,100.

ECONOMIC CONDITIONS

Uintah County, Utah

The principal manufacturing activities include lumber and wood products, food products, fabricated textile products, and chemicals, all of which remain relatively minor in the overall dollar value contribution to the economy. Without development of the oil industry and tourism, the area would have continued in a relatively depressed economic state during the early to mid-1970s as it relied on agriculture, gilsonite, and phosphate mining for its principal source of income.

Uintah County Financial Resources and Institutions

Property taxes provide the main source of revenue for the city and county governments.

Vernal City government expenditures for the years 1976 through 1978 show a percentage increase in per capita expenditures of 16.5 percent. Uintah County expenditures show an increase in per capita cost of 254.2 percent over the same period.

Uintah County estimates its per capita costs for 1979 were $725.17 (Gilbert, 1980).

The financial resource base of the Uinta Basin is relatively limited, as is the case for most sparsely populated rural areas. However, the conven-

tional oil boom has added significantly to private wealth, as well as to public sector revenues from sales and property taxes.

Uintah County Personal and Per Capita Income

Table 3-12 shows the median family and per capita incomes for Uintah County, as well as for the State of Utah. Median family income and per capita income in Uintah County are below the state level. However, percentage changes from 1970 to 1975 for per capita income indicate that Uintah County growth has been greater than that for the State of Utah.

TABLE 3-12

Uintah County and Utah
Median Family and Per Capita Income

	Median Family Income			Per Capita Income		
	Amount		Percent Change	Amount		Percent Change
	1970[a]	1975[b]	1970[a]-1975[b]	1970[a]	1975[b]	1970[a]-1975[b]
Uintah County	$8,082	$13,152	+ 62.7	$2,234	$3,574	+59.9
State of Utah	9,320	14,329	+ 53.7	2,697	4,022	+49.1

Source: [a]U.S. Department of Commerce, 1970a.

[b]U.S. Department of Commerce, 1977.

Labor Force and Employment

Table 3-13 illustrates the labor force estimates for Uintah County and the State of Utah. As indicated by the table, county unemployment rates are lower than the state average. This trend is expected to continue as the area hosts economic growth including energy-related industry.

TABLE 3-13

Uintah County and Utah
Labor Force and Employment

	Total Labor Force	Total Employed	Total Unemployed	Percent Unemployment
Uintah County	8,400	8,100	300	3.5
State of Utah	613,800	589,100	24,700	4.0

Source: Utah Department of Employment Security, 1979.

From 1970 to 1979, the total labor force in Uintah County increased 91.6 percent. Increased activity in conventional oil and gas exploration and production has resulted in rapid growth of employment in energy-related industry. Overall employment increased by 13.1 percent between 1970 and 1976.

The U.S. Bureau of Labor statistics considers 260 days per year as a full employment standard. Approximately 44 percent of the total labor force worked an average of less than 250 days per year. These figures characterize outdoor, weather-sensitive activities, (i.e., oil field work, construction, etc.).

Rio Blanco County, Colorado

The economy of the area has been tied to its natural resources. Rio Blanco County produces 60 percent of Colorado's petroleum and 37 percent of its natural gas. Nevertheless, agriculture has remained a viable and significant contributor to the area's economy.

Property taxes provide the main source of revenue for the city and county governments.

Rio Blanco County Financial Resources and Institutions

The principal sources of revenue to state government in Colorado are an income tax and a 3-percent sales and use tax. At the city and county levels, property taxes provide the main source of revenue.

Future developments in the mineral extraction and utilities industries can be expected to make substantial contributions to the local tax base.

The Rangely Town government expenditures for 1977 and 1978 show a per capita increase of 110.7 pecent. Rio Blanco County's government expenditures for 1977 and 1979 show a per capita increase of 39.3 percent.

Rio Blanco County estimates its total per capita costs for 1979 were $1,005.87 (Bloomfield, 1980).

Rio Blanco County Personal and Per Capita Income

Table 3-14 shows the median family and per capita incomes for Rio Blanco County and the State of Colorado. Median family and per capita income in Rio Blanco County are below the state level. However, the growth rate within Rio Blanco County has been greater than that for the State of Colorado.

TABLE 3-14

Rio Blanco County and Colorado
Median Family and Per Capita Income

	Median Family Income				Per Capita Income			
	Amount		Percent Change		Amount		Percent Change	
	1970[a]	1975[b]	1970[a]	1975[b]	1970[a]	1975[b]	1970[a]	1975[b]
Rio Blanco County	$8,007	$11,054[c]	+38.0		$2,481	$4,135	+66.6	
State of Colorado	9,552	12,990	+35.9		3,106	4,884	+57.2	

Source: [a]U.S. Department of Commerce, 1970a.

[b]U.S. Department of Commerce, 1977.

[c]Colorado Department of Health, 1976.

Rio Blanco County Labor Force and Employment

There has been an upward trend in the number of jobs in Rio Blanco County. However, employment in the agriculture and service sectors has declined, while energy-related industry employment has shown the greatest increase.

Table 3-15 illustrates the labor force estimates for Rio Blanco County and the State of Colorado for May 1979. County unemployment rates are well below the state average of 3.2 percent. This trend is expected to continue as the area's continued growth in energy-related industry adds to the area's economy. The Rio Blanco County labor force increased approximately 18.5 percent from 1970 to 1978.

TABLE 3-15

Rio Blanco County and Colorado
Labor Force and Employment

	Total Labor Force	Total Employed	Total Unemployed	Percent Unemployment
Rio Blanco County	2,600	2,554	46	1.8
State of Colorado	1,370,000	1,326,000	44,000	3.2

Source: Colorado Department of Labor and Employment, 1979.

Approximately 47 percent of the total Rio Blanco labor force worked an average of less than 250 days per year. These figures characterize activity dominated by weather-sensitive operations.

HOUSING

Among the most basic elements indicative of a community's level of living is the nature and condition of its housing. Housing is also one of the most immediately impacted areas during large-scale construction projects.

Recent residential construction has improved the overall housing profile for the region, but it has not met the need for additional housing generated by the existing and the potential energy-related population growth.

Uintah County Housing

Table 3-16 indicates the year-round housing stock for Uintah County and Vernal between 1970 and 1976.

TABLE 3-16

Uintah County and Vernal
Year-Round Housing Units

	Owner Units		Rental Units		Mobile Homes		Total	
	1970[a]	1976[b]	1970[a]	1976[b]	1970[a]	1976[b]	1970[a]	1976[b]
Uintah County	2,565	3,196	868	1,081	297	1,030	3,730	4,986
Vernal	822	1,173	278	397	23	323	1,123	1,830

Source: [a]U.S. Department of Commerce, 1970b.

[b]Uinta Basin Association of Governments, 1977.

Factors contributing to the existing housing problems in the area include: high construction costs, high mortgage rates, inadequate family income, and transitory influx of construction and mining employment, and the risk of not being able to sell new or preowned housing.

Because of the potential demand for housing, several subdivisions have been developed. Although these building sites tend to alleviate the demand for housing in the upper income brackets, affordable housing for moderate-to-middle income groups will remain a scarce commodity. In addition, there are four new mobile home parks in Vernal.

Rio Blanco County Housing

A shortage of adequate and affordable housing is one of the most serious problems facing Rangely. Moderately priced, single-family conventional housing is virtually unavailable. Construction costs and mortgage rates are prohibitively high and leave only mobile homes as a housing alternative for Rangely's moderate-income families.

However, Rio Blanco County has approved the issuance of tax exempt bonds by the county to finance a Residential Mortgage Program for the purpose of expanding the availability of capital to finance housing for low and middle income persons in the county.

The first bond issue is a combined issue in cooperation with Moffat County, Colorado in the amount of $15 million. A possibility exists for a second issue when the first issue is used up (Rehborg, 1980).

Table 3-17 indicates the year-round housing stock for Rio Blanco County and Rangely between 1970 and 1976.

TABLE 3-17

Rio Blanco County and Rangely
Year-Round Housing Units

	Owner Units		Rental Units		Mobile Homes		Total	
	1970[a]	1976[b]	1970[a]	1976[b]	1970[a]	1976[b]	1970[a]	1976[b]
Rio Blanco County	1,140	1,467	683	716	145	340	1,968	2,523
Rangely[c]	273	381	165	254	85	115	523	750

Source: [a]U.S. Department of Commerce, 1970b.

[b]Department of Local Affairs, 1978.

[c]Rangely Town Clerk, 1979.

Approximately 490 building sites were added in the Rangely area in 1979. In addition, three new mobile home parks have been added to the area.

COMMUNITY SERVICES

Uintah County, Utah

Uintah County Education

The Uintah County School District is comparable to the state in the area of average faculty salary, and exceeds the state average for pupil/teacher ratio. Selected data concerning the school system in 1977 is presented in table 3-18.

TABLE 3-18

Uintah County and Utah
Selected School System Data - 1977

	Percent of Faculty With Masters Degree	Maximum Salary	Number of Schools	Pupil/Teacher Ratio
Uintah County	20.4	$13,500	9	27.2
State of Utah	27.7	13,826	563[a]	22.8

Source: Bureau of Economic Research, 1979.

[a]Bureau of Economic Research, 1978.

The Uintah County School District had enrollments at almost all grade levels that exceeded the system's designed capacity. This situation was alleviated at the elementary grade level in the fall of 1980 with the opening of a new elementary school having a capacity for 650 students.

Table 3-19 shows the amount of student population growth as projected by the district through 1984.

TABLE 3-19

Uintah County
Student Enrollment Projections

1980-81	1981-82	1982-83	1983-84
5,164	5,330	5,374	5,500

Source: Uintah School District Superintendent, 1980.

The district currently has some flexibility, with trailer facilities and relocatable classrooms, capable of accommodating approximately 200 students.

To adequately prepare for an energy boom, the Uintah School Board has purchased 85 acres of land for future school construction and use. This would cut the cost of future land acquisition and speed up the process of providing new facilities should the need arise. The school district is presently free of bonded indebtedness.

Vernal Municipal Water Systems

Vernal's water system has a storage capacity of 2.5 million gallons and a deliverable capacity of 9 million gallons per day (mgd). Peak demand is 8.65 mgd. An additional 3 million gallon storage tank is to be built in the spring of 1981. The system has a conditionally approved state health rating, pending corrective action currently underway.

To meet additional water needs, Vernal has access to the Red Fleet Dam and Reservoir. This reservoir could supply the Vernal area water system with 12,000 acre-feet of water for municipal and industrial use.

The distribution system in Vernal is under repair through the use of a $300,000 bond issue approved in 1979. The Central Utah Project is building a water treatment plant in order to use water from the Red Fleet Reservoir. This plant is scheduled to be built by 1982. Vernal City also expects to receive a grant from the Farmer's Home Administration and the State of Utah to increase their storage capacity and add some new water lines.

Vernal Municipal Waste Water Facilities

Vernal City has a waste water treatment plant with a capacity of 2.7 mgd and a design population equivalent of 7,500 people. The average flow is 1.7 mgd.

The Vernal system presently serves most of Vernal City and a limited number of county residents in the immediate vicinity. The disposal system, which was placed in operation in 1957, is overloaded due to increases in population and infiltration of ground water into the collection system.

A valley-wide sewer system is to be constructed in Ashley Valley. This system would solve the various problems associated with the existing collection and disposal systems.

Local governments have received a $6.8 million grant from the EPA and state funds for a new sewage treatment lagoon system and new sewer lines. Construction began in March of 1980 and should be completed in 1981. The new plant is designed to accommodate a population of about 20,000 people with provisions for modifications to more than double this capacity.

Vernal City Fire Protection

The City of Vernal is served by an all-volunteer fire department with 20 active members. Their equipment consists of two 1,250-gallon-per-minute (gpm) pumpers, one 750-gpm pumper, and one 500-pound dry chemical unit.

Fire protection class ratings range from 1, the most adequate, to 10, the least adequate. The City of Vernal has a class rating of 6.

Uintah County Law Enforcement

Law enforcement in Uintah County is administered by the Uintah County Sheriff's Department, the Vernal Police Department, and the Utah State Highway Patrol. Uintah County has one full-time sheriff and nine deputies. The Utah Highway Patrol has 13 patrolmen assigned to cover the major highways throughout the county.

The City of Vernal has 13 full-time officers, 13 patrol cars, and one truck at its disposal.

A 6-cell detention facility is operated by the Uintah County Sheriff's Department in Vernal.

Vernal and Uintah County Health Facilities and Personnel

Table 3-20 shows the ratio of doctors and dentists to population in the area in 1979.

TABLE 3-20

Uintah County Physician-Dentist/Population Ratio

	Total Number of Physicians	Physician/ Population Ratio	Total Number of Dentists	Dentist/ Population Ratio
Vernal	6	1:1100	7	1:943
Uintah County	6	1:3413	7	1:2925
State of Utah (1976)[a]	1,801	1:684	851	1:1447

Source: Uintah County Hospital, 1979.

[a]Bureau of Economic and Business Research, 1979.

Vernal has three medical clinics, and a new 36-bed hospital, and no free or nonprofit clinics. The hospital is fully equipped for surgery and other procedures and is currently being utilized well under capacity.

Ambulance service is provided by Uintah County and staffing is provided by volunteer emergency medical technicians.

Rio Blanco County, Colorado

Rio Blanco County Education

Although the Rio Blanco County School District (RE-4) average faculty salaries are lower than the state average, the District is well below the state average for pupil/teacher ratio. Selected data concerning the school system is presented in table 3-21.

TABLE 3-21

Rio Blanco County and Colorado
Selected School System Data - 1977

	Rio Blanco County	Colorado
Percent of Faculty with Masters Degree	39.5	38.0
Average Salary	12,393.0	14,018.0
Number of Schools	3.0	1,263.0
Pupil Teacher Ratio[a]	14.3	19.6

Source: [a]Colorado Department of Education, 1978.

The Rio Blanco County School District (RE-4) has enrollments at all grade levels that are well below the system's design capacity. Enrollment figures for the 1979 school year indicate an average utilization of 46 percent of the 1,200 student capacity.

Table 3-22 shows the projected student population growth for the years 1980 through 1984.

TABLE 3-22

Rio Blanco County
Student Enrollment Projections

1980	1981	1982	1983	1984
610	635	660	710	760

Source: Rangely Superintendent of Public Schools, 1979.

Rangely Municipal Water Systems

Rangely's water supply is presently provided by an intake from the White River. The plant storage capacity is 0.75 mgd which equals the town's summertime peak demand (Beard, 1980). The storage and distribution system was rebuilt in 1965 and is in good condition. The system meets applicable state and local standards.

A new treatment plant for Rangely was completed in 1978. The old plant will be retained for emergencies and to provide service during future expansions of the new plant.

Present capacity is 2.6 mgd and would service a population of up to 5,000 persons. The new plant will eventually provide 4.32 mgd to serve a population of approximately 10,000 persons. Rangely holds a 30.95-cfs water right on the White River for future expansion.

Rangely Municipal Waste Water Systems and Treatment Facilities

Sewage collection and treatment is provided by the Rangely Sanitation District, the boundaries of which closely coincide with the town limits.

The sewage treatment plant has a design capacity to serve a population of 10,000. Construction has been staged to initially serve 4,000 persons and handle 0.4 mgd, with a second stage to serve an additional 6,000 persons and handle 1.0 mgd.

Rangely Fire Protection

Rangely is served by an all-volunteer fire department with 22 active members. Their equipment consists of five vehicles, which include one 1,250-gpm pumper, one 1,100-gal. tanker, and one 90-gpm "quick attack" truck. They also plan to add a new 500-gal. tanker when funds permit.

Fire protection class ratings range from 1, the most adequate, to 10 the least adequate. Rangely has a class rating of 8.

Rio Blanco County Law Enforcement

Law enforcement in Rangely is administered by the County Sheriff's Department, the Rangely Police Department, and the Colorado State Highway Patrol. The Sheriff's Department has three full-time deputies stationed in Rangely. The Colorado Highway Patrol has two patrolmen in Rio Blanco County. Rangely has four full-time officers, three patrol cars, and a 2-cell detention facility.

Rio Blanco County Health Facilities and Personnel

Table 3-23 indicates the number of physicians and dentists available in 1979 relative to the Rangely area population.

TABLE 3-23

Rio Blanco County and Colorado
Physician-Dentist/Population Ratio

	Total Number of Physicians	Physician/ Population Ratio	Total Number of Dentists	Dentist/ Population Ratio
Rangely[a]	2	1:1056	1	1:2112
Rio Blanco County[b]	4	1:1562	2	1:3124
State of Colorado (1970)[b]	3,795	1:581	1,104	1:1999

Source: [a]Rangely District Hospital, 1979.

[b]U.S. Department of Commerce, County and City Data Book, 1977.

The Rangely District Hospital and Medical Clinic presently have two full-time practicing physicians and a full-time dentist.

The Rangely District Hospital has a capacity of 28 beds and could serve a population of between 7,500 and 9,000 people. Based on current population projections, there would be a need to add 12 additional beds by 1983 if oil shale developments were approved. The hospital provides ambulance service in the Rangely area. The hospital is currently used at about 20 percent of capacity.

QUALITY OF LIFE

Uintah and Rio Blanco County Community Homogeneity

Historically, communities in Uintah and Rio Blanco Counties have been culturally homogeneous and have valued neighborliness, friendliness, mutual self-help, close family ties, family pride, economic independence, local autonomy, and a strong religious life. Energy development since World War II has gradually weakened this cultural homogeneity.

Uintah and Rio Blanco County Public Attitudes

Residents have traditionally regarded the natural environment as important to personal psychological well-being. While local people enjoy the rural landscape character, great emphasis is also placed on controlled economic development which must inevitably result in increased urbanization. In response to a survey (Opinion Sampling Research Institute, 1975) concerning the alternatives of economic growth versus rural character, 63 percent of Vernal residents indicated economic growth was important, 26 percent felt that rural character was important, and 11 percent were undecided. Sixty-one percent of the Rangely populace said economic growth was important, 27 percent stated rural character was important, and 12 percent were undecided. A similar percentage spread indicated that increases in population would be favored if local taxes would rise only moderately.

In Rangely, there is an apparent increasing liberal attitude toward growth. Growth is regarded as important to economically uplift the area out of a declining period of oil production, which in the past has been the community's main source of income. Conversely, northwestern Colorado residents do not want growth to become unmanageable or to destroy the existing fabric of social life. It has been expressed previously that they do not want to pay the social and environmental costs of power generation that would be exported to distant cities (USDI, BLM, 1976).

County commissioners from both Uintah and Rio Blanco County have recently expressed a positive attitude toward having the Moon Lake project in their respective areas.

An attitudinal survey of the Vernal area (Geertsen et al., 1975) indicated that 79 percent of residents said their community was a good or excellent place to live, and 64 percent felt they were fully accepted as a part of the community. In response to whether the community was a good place to raise a family, 49 percent said it was a strong point for Vernal, and 38 percent thought it was satisfactory. Asked if the community provided opportunities to earn a livable income, nearly 43 percent said it was satisfactory, and 33 percent said it was a community strength. (Similar data from the Rangely area is not available.)

Quality of Life Indicators

Energy development has already caused substantial changes in population mix and patterns of everyday life in the communities within the project area.

Conservative social attitudes and emphasis on strong family ties have thus far maintained average to low divorce rates in the area. Divorce rates of 3.6 per 1,000 population have been recorded for Uintah County in 1975, 6.2 per 1,000 for 1976, and 4.7 per 1,000 for 1977 (Utah Bureau of Health Statistics). Comparable figures for Rio Blanco County are: 4.2 per 1,000 for 1975, 5.3 per 1,000 for 1976, and 5.4 per 1,000 for 1977 (Colorado Health Statistics and Vital Records Division).

For its population size, juvenile delinquency appears to be a substantial problem in the impact area. Uintah County reported 455 offenses in 1978 (Utah Juvenile Court, 1978). The Rio Blanco County Sheriff's Office reported 34 juvenile arrests in 1978. In contrast, low incidence of dropouts has been indicative of the emphasis traditionally given to formal education. In the last 3 years, Rangely High School (1979 enrollment of 318) experienced a total of 26 dropouts and Uintah High School (Vernal) (1979 enrollment of 866) had 38 dropouts (Uintah and Rangely High Schools, 1979).

There are low incidences of crime, as would be expected in a rural area. Table 3-24 lists the basic crime statistics that have been recorded for the project area.

TABLE 3-24

Crime Statistics for 1978

	Total County Population	Murder	Rape	Robbery	Assault	Burglary	Larceny Theft	Motor Vehicle Theft
Uintah County	18,600	0	0	1	1	21	92	20
Rio Blanco County	5,300	0	0	0	9	50	125	6

Sources: Utah Bureau of Criminal Identification, 1978.
Colorado Bureau of Investigation, 1978.

SECONDARY INFLUENCE ZONE

INTRODUCTION

The secondary influence zone is defined as the area within about a 2-hour driving distance from Vernal and Rangely (figure 3-5). Studies have shown that most people will drive up to 2 hours for weekend recreation (Utah Dept. of Natural Resources, 1973). It is assumed that most recreational pursuits would be confined to this area.

The Uinta Basin makes up the majority of the secondary influence zone. It is bordered by the Uinta Mountains on the north, the Wasatch Mountains and high plateaus on the west, the White River Plateau and the West Elk Mountains on the east, and the Uncompaghre Plateau on the southeast (Thornbury, 1965). It is rich in energy resources such as minerals, oil shale, oil and gas, and tar sands. Many plans and proposals have been made for the development of these resources, but no accurate projections of the extent and time of development can be made.

Only those resources which could be significantly impacted by increased recreational activities are described below.

THREATENED AND ENDANGERED PLANT SPECIES

Within the secondary influence zone, there are 44 plant species that have been identified as threatened and endangered (see Appendix 15).

One plant species, the Uinta Basin hookless cactus (*Sclerocactus glaucus*) has been officially listed (*Federal Register*, October 11, 1979).

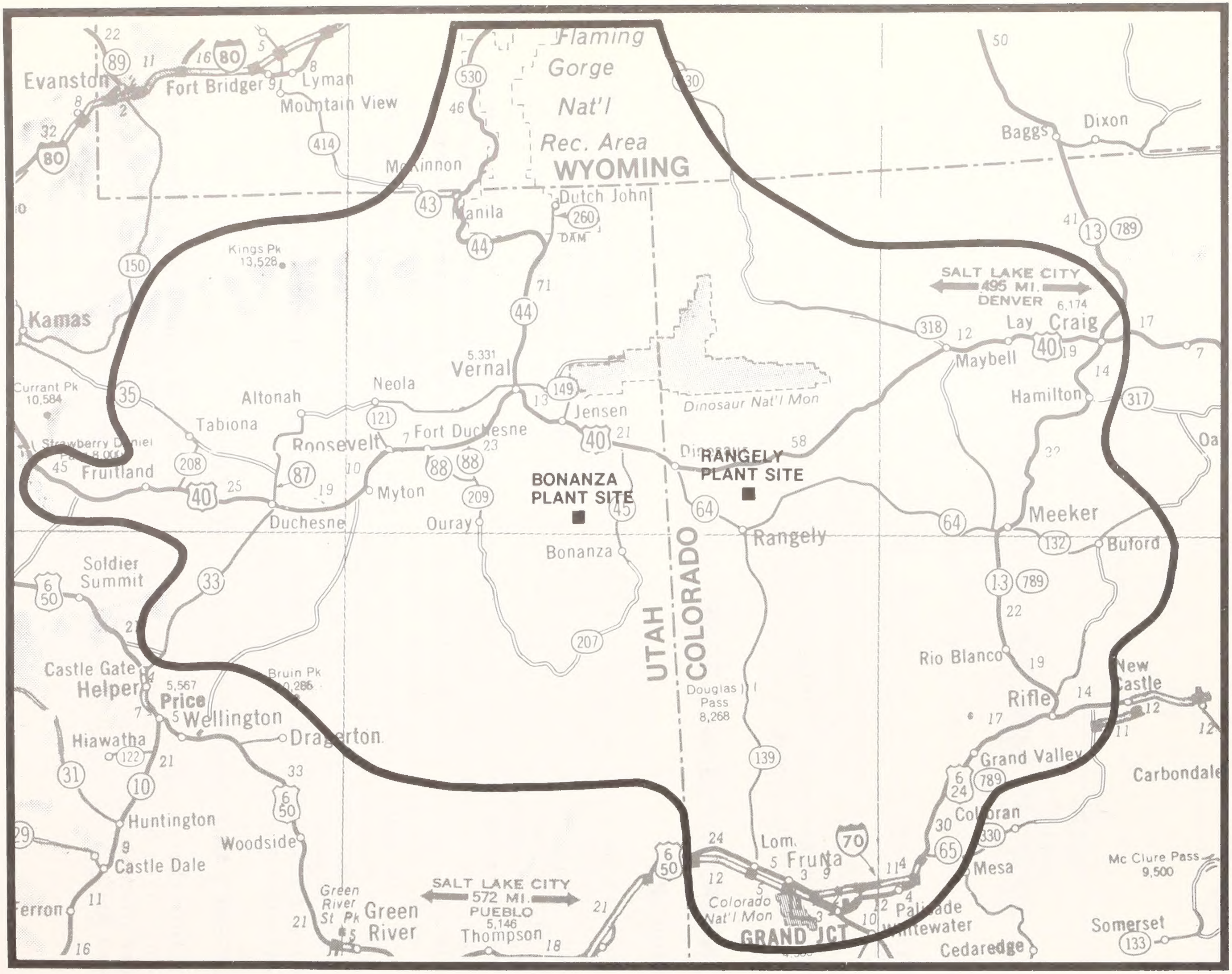


FIGURE 3-5

SECONDARY INFLUENCE ZONE

ANIMAL LIFE

TERRESTRIAL

Over 400 species of vertebrate wildlife are found within the secondary influence zone. Of major importance are: four species of endangered wildlife (bald eagle, peregrine falcon, whooping crane, and the black-footed ferret); five big game species; 11 species of upland and small game; 10 species of waterfowl; and wild horses. All of the above are of importance or are protected by Federal and State laws for their endangered status or other public concern. Their general distribution is shown in figure 3-6.

Big game species in the area are elk, mule deer, pronghorn antelope, bighorn sheep, and moose. The Uinta Mountain range and its foothills are one of the region's best elk and primary moose habitats. Mule deer are the most abundant big game species and the region provides a great deal of critical winter and summer habitat for this species. Antelope are found throughout the region. Upland and small game include mountain lion, bear, sage grouse, ringneck pheasants, blue and ruffed grouse, Merriam's turkey, mourning dove, snowshoe hare, and cottontail rabbits.

The secondary influence zone is in a major north-south flyway for migrating waterfowl and is used by nesting waterfowl.

The bald eagle is a winter migrant which primarily uses areas where water is abundant; however, it does hunt in non-water areas and often utilizes road kills for a winter food supply. The peregrine falcon inhabits the area. Nesting areas have been reported in Dinosaur. The whooping crane passes through the area in spring and fall as it migrates south from nesting areas in Idaho to winter in New Mexico. The black-footed ferret is extremely rare and may no longer inhabit the area.

There is also a herd of wild horses (approximately 35 to 40) in the vicinity of Bonanza, Utah which ranges in the rough country north of the White River.

AQUATIC

Important Utah fisheries within the region include Flaming Gorge, Steinaker, Pelican Lake and Bottle Hollow Reservoirs, and many other small lakes and stream fisheries that support both warm and cold water species. Flaming Gorge is important for its year-round and trophy fishing.

The Green River is a critical reproduction area for endangered and rare fish.

Important Colorado fisheries within the region include Trappers Lake, Lake Avery, Rio Blanco Lake, Highline Lake, Rifle Gap, Grass Valley, Elk Head, and Mack Mesa Reservoirs along with many high mountain and stream fisheries. Colorado cutthroat inhabitat Trappers Lake, and it is the only source of eggs for this species. Rifle Gap and Elk Head Reservoirs are important because they support both warm and cold water species.

Colorado sections of the White, Green, and Colorado Rivers are also important habitat for the same endangered and rare species as found in the Utah sections of these rivers.

Some inadvertent losses of endangered fishes could occur as a result of inreased fishing pressure; however, it is not expected to adversely affect the continued existence of these species or adversely modify their essential habitats.

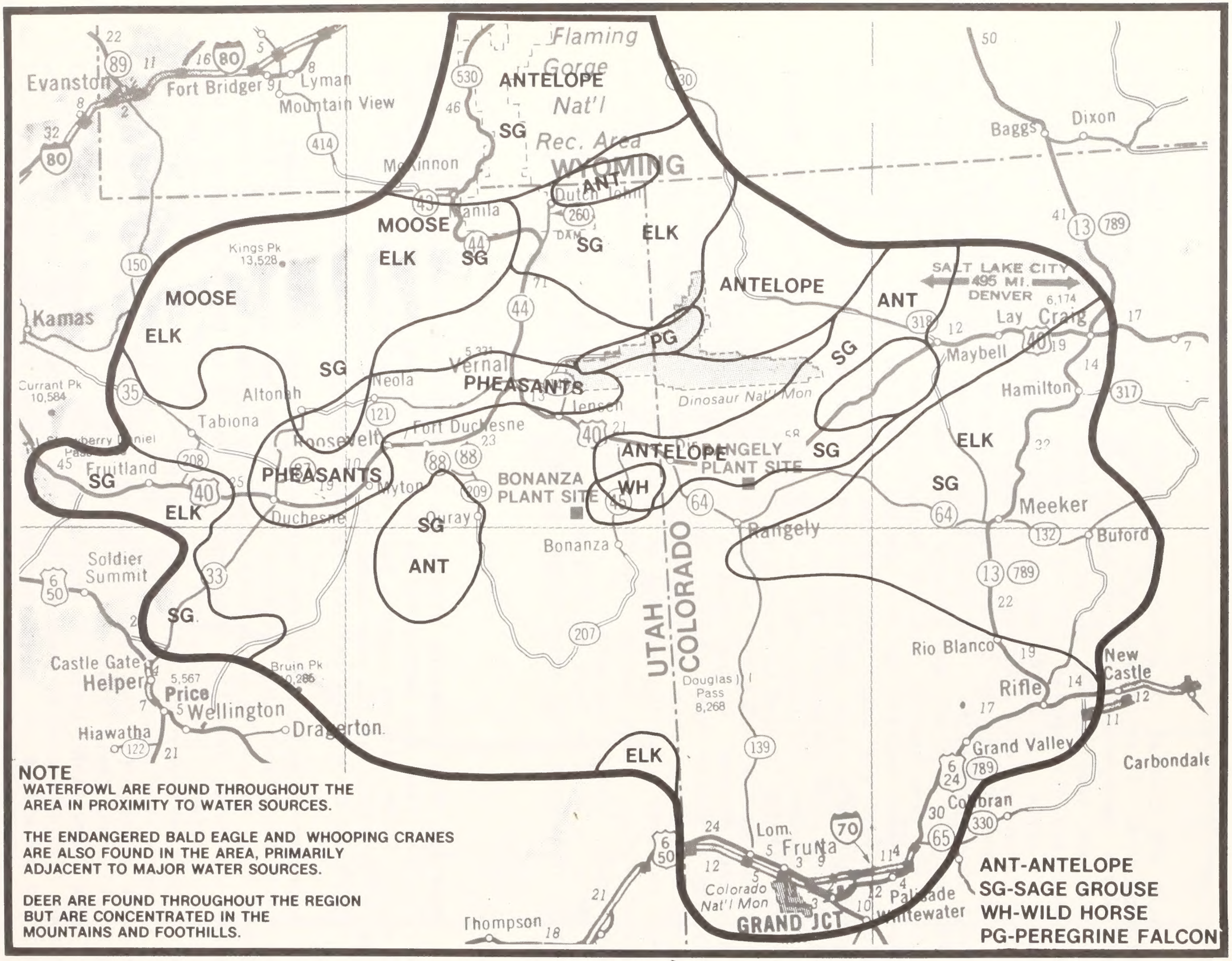


FIGURE 3-6

WILDLIFE WITHIN THE SECONDARY INFLUENCE ZONE

CULTURAL RESOURCES

Within the secondary influence zone, 17 sites are currently listed in the National Register of Historic Places (as of March 4, 1980). Seven of these are in Utah, ten in Colorado, and most are prehistoric villages and rock art sites. A few historic ranches and cabins complete the list.

In addition, Utah and Colorado have designated 39 sites in the secondary influence zone as having State and local significance--3 in Utah and 36 in Colorado (Burns and McDonnell, 1980c). The majority of these are historic cabins, ranches, and homesteads.

RECREATION

Several major recreation attractions are within the secondary influence zone including Flaming Gorge National Recreation Area, Dinosaur National Monument, Colorado National Monument, and the Flat Tops Wilderness and High Uintas Primitive Areas (see figure 3-7). There are two national forests and five state parks within the zone. These attractions are summarized in table 3-25. Developed facilities in these areas that are used near capacity and would deteriorate with small increases in use are summarized in Appendix 18.

Due to public ownership, much of the land in the influence zone is available for dispersed outdoor recreation. Water-based activities occur at Flaming Gorge and other reservoirs, and on the Green River in Lodore, Whirlpool, Split Mountain, Desolation, and Gray Canyons.

Both Vernal and Rangely have active municipal/county recreation programs and recently constructed community recreation centers. Facilities are summarized in table 3-26.

TRANSMISSION SYSTEM

INTRODUCTION

The affected environment for each resource is displayed by segment in figures 3-8 through 3-23. The segments are identified in the pocket map located at the back of the book. The affected environment is summarized in table 3-27 and Appendix 19 provides a description of the resource categories presented in table 3-27.

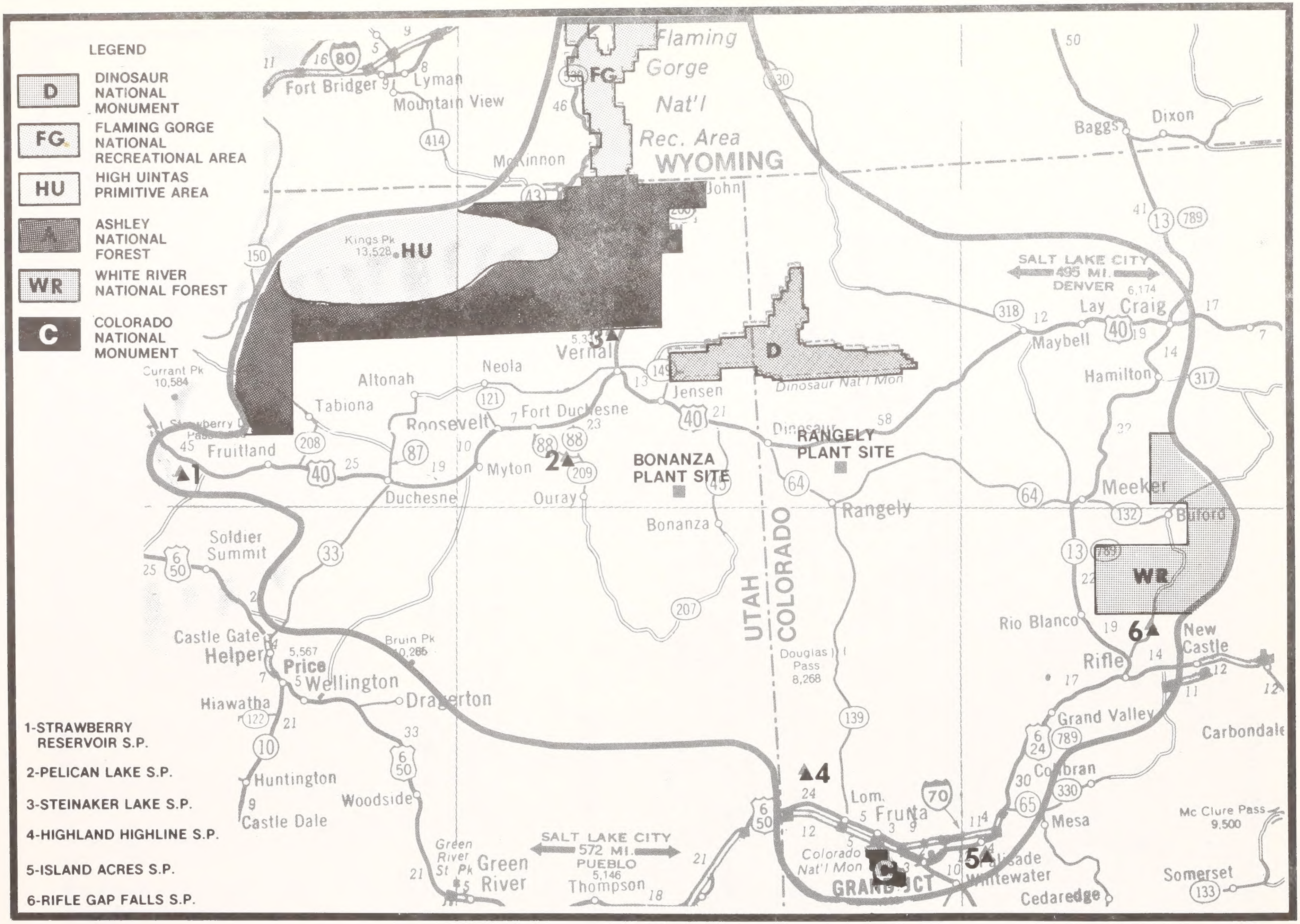


FIGURE 3-7

RECREATIONAL AREAS WITHIN THE SECONDARY INFLUENCE ZONE

TABLE 3-25

Recreation Attractions Within Secondary Influence Zone

Administering Agency	Site	Attraction (Special Values)	Location
National Park Service	1. Colorado National Monument	Unique geologic features, camping, scenic areas, hiking.	Grand Junction, CO.
	2. Dinosaur National Monument	Fossil excavations, camping, hiking trails, river rafting, Island Park Game Management Area.	NE Utah, NW Colorado.
U.S. Forest Service	3. Ashley National Forest	Flaming Gorge National Recreation Area, High Uintas Primitive Area, Drive Through the Ages, Sheep Creek Canyon Geologic Area, camping, hiking, boating, river rafting, hunting, fishing, snowmobiling.	NE Utah.
	4. White River National Forest	Flat Tops Wilderness, Trapper Lake, hiking; camping, hunting, fishing.	NW Colorado.
U.S. Fish and Wildlife Service	5. Ouray National Wildlife Refuge		E Central Utah.
	6. Jones Hole Federal Fish Hatchery		NE Utah
	7. Brown's Park National Wildlife Refuge		NE Utah
State of Utah	8. Starvation Lake State Beach	Starvation Lake, camping fishing, boating.	NE Utah
	9. Steinaker Lake State Recreation Area	Steinaker Reservoir, camping, boating, fishing.	NE Utah
	10. Stewart Lake Waterfowl Management Area		NE Utah
	11. Whiterocks Fish Hatchery		NE Utah
State of Colorado	12. Highline State Park	Scenic views, camping, boating, swimming.	Loma, CO.
	13. Island Acres State Park	Rock climbing, swimming, camping.	Grand Junction, CO.
	14. Rifle Gap Falls State Park	Camping, hiking, rock climbing, boating.	Rifle, CO.
	15. Rifle Falls Wildlife Area		Rifle, CO
	16. Rio Blanco Wildlife Area		NW Colorado.
Other	17. Bottle Hollow Resort	Fishing, boating.	Roosevelt, UT.
	18. Green River	Rafting, fishing.	NE Utah, NW Colorado.
	19. Midview Reservoir	Fishing.	NE Utah.
	20. Pelican Lake	Fishing	NE Utah.
	21. Strawberry Reservoir	Fishing, camping	NE Utah

TABLE 3-26

Municipal Recreation Facilities

	Vernal	Rangely
Fairground	1	
Golf Course		1 (planned)
Tennis Courts	8	
Swimming Pools	1	1
Shooting Range	1	
Baseball Fields	6	2
Ice Rink	1	
Town Parks	25 acres	17.5 acres (two additional planned for about 70 acres)
Recreation/Open Space	873 acres	600 acres

TABLE 3-27

Transmission System Affected Environment[a]
Section A
Bonanza Unit 1 Routing Alternatives

Resource Category	Bonanza to Tank Hollow--345-138-kV Combined System via.				Bonanza or Rangely Plant Site Tank Hollow to Mona--345-kV System via		
	Upalco-Fruitland	Upalco-Sowers	Castle Pk.-Sowers	Castle Pk.-Fruitland	Dairy Fork	Thistle Canyon	Utah Valley
Soil Erosion Hazard							
Moderate	76.7	74.7	82.7	86.7	--	--	--
Severe	45.0	57.0	57.0	45.0	48.8	50.1	41.1
Paleontology							
High	105.7	93.7	110.2	123.6	12.0	13.8	18.8
Moderate	10.0	37.0	27.0	--	19.8	12.3	--
Low	1.0	1.0	--	--	15.0	19.0	10.0
Negligible	5.0	--	2.5	7.5	2.0	5.0	12.8
Vegetation Types							
Cold Desert	72.1	78.2	103.2	95.2	12.0	15.0	13.8
Pinyon-Juniper	15.5	19.1	15.5	15.5	13.3	19.6	17.3
Forest	8.0	8.5	7.0	8.0	4.4	4.0	3.5
Mountain Brush	6.5	9.0	9.0	6.5	18.5	11.5	--
Cultivated	20.0	17.0	5.0	6.5	0.6	--	6.5
Riparian (number of crossings)	5	3	8	9	1	2	2
Threatened and Endangered Species Habitat	12.5	19.5	45.0	41	2.0	2.2	2.2
Animal Life Habitat[b]							
Terrestrial							
Antelope	4.0	4.0	4.0	4.0	--	--	--
Deer	51.5	40.0	45.0	38.0	38.0	40.3	29.3
Elk	23.0	40.0	40.0	23.0	35.2	37.5	8.8
Sage Grouse	16.5	36.0	48.5	22.0	4.0	4.0	--
Turkey	--	--	--	--	1.2	1.2	--
Golden Eagles	5.0	--	--	5.0	--	--	0.5
Wild Horse	--	--	59.0	42.5	--	--	--
Waterfowl	9.0	3.0	14.0	18.0	--	--	--
Moose	--	--	--	--	--	--	
Threatened and Endangered							
Whooping Crane	2.0	2.0	--	--	--	--	--
Bald Eagle	5.0	2.0	14.0	16.0	--	--	--
Aquatic (No. of crossings)							
Threatened and Endangered	1	1	2	2	--	--	--
Trout							
Critical	1	--	--	1	--	--	--
High Priority	--	--	--	1	--	1	1
Substantial	2	4	4	1	2	2	3
Limited	--	--	--	1	--	--	--
Channel Catfish							
Limited	--	1	1	1	--	--	--
Small Fishery	--	--	--	--	--	--	--
Cultural Sites							
Eligible for Listing	--	--	--	--	--	--	--
Not Eligible	--	--	4	1	2	2	--
Visual Resource Management							
Scenic Quality							
A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	37.5	61.0	60.5	24.5	29.6	24.5	37.0
C	84.2	70.7	79.2	107.2	20.0	25.6	4.1
Visual Zone							
F	40.5	53.0	71.2	72.7	11.0	27.1	38.1
M	50.0	57.5	48.5	29.0	10.0	10.5	3.0
B	20.7	10.7	20.0	30.0	21.6	5.5	0.0
SS	10.5	10.5	0.0	0.0	7.0	7.0	0.0

TABLE 3-27

Transmission System Affected Environment[a]
Section A
Bonanza Unit 1 Routing Alternatives

Bonanza or Rangely Plant Site			Bonanza--138-kV System via.		
Price Canyon-Water Hollow--345-kV via:				Bonanza-Rangely	Bonanza-Rangely
Eccles Canyon	Sowers Canyon/Dairy Fork	Sowers Cyn/Thistle Cyn	Bonanza-Vernal	Little Bonanza	Mellon Hill
--	--	--	25.5	23.7	25.7
39.5	54.5	55.0	--	--	--
19.5	8.5	21.5	4.2	21.2	10.0
20.0	22.2	23.7	17.0	2.5	15.7
--	--	3.5	4.3	--	--
--	--	6.3	--	--	--
17.5	14.0	24.3	18.6	16.2	25.7
--	2.7	14.2	4.6	7.5	--
12.0	8.0	6.5	--	--	--
9.0	21.8	10.0	--	--	--
--	5.0	--	2.3	--	--
1.0	1.0	4.0	0	3	0
0.7	1.7	2.5	8.0	6.2	3.0
--	--	--	4.0	4.0	4.0
6.0	48.7	54.8	--	--	--
6.0	46.0	52.8	--	--	--
--	25.0	25.0	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	6.2	2.0
--	--	--	1.0	1.0	--
8.0	--	--	--	--	--
--	--	--	--	--	--
--	--	--	1.0	1.0	--
4	3	--	1	1	1
--	--	--	--	--	--
1	--	--	--	--	--
3	3	1	--	--	--
--	--	3	--	--	--
--	--	--	--	--	--
--	--	--	--	--	1
--	--	--	--	--	--
--	--	--	--	1	--
1.9	0.0	49.5	0.0	0.0	0.0
26.6	50.8	5.5	4.0	4.5	2.5
11.0	0.7	--	21.5	13.0	23.2
14.8	21.0	29.0	16.3	0.0	15.7
5.9	6.0	6.0	2.0	11.0	4.0
7.0	18.8	14.3	7.2	3.0	3.5
11.8	5.7	5.7	0.0	3.5	2.5

(continued)

TABLE 3-27, Section A (continued)

Resource Category	Bonanza to Tank Hollow--345-138-kV Combined System via.				Bonanza or Rangely Plant Site Tank Hollow to Mona--345-kV System via		
	Upalco-Fruitland	Upalco-Sowers	Castle Pk.-Sowers	Castle Pk.-Fruitland	Dairy Fork	Thistle Canyon	Utah Valley
Visual Resource Management (continued)							
Sensitivity							
H	22.0	8.0	20.5	25.0	0.0	0.0	22.3
M	64.2	62.5	31.0	63.0	32.1	43.6	18.8
L	21.5	61.2	88.2	43.7	17.5	6.5	0.0
Existing Contrast							
L	58.7	52.2	74.0	70.0	32.6	14.5	0.0
M	63.0	71.5	55.2	44.7	16.0	26.1	6.8
H	0.0	8.0	10.5	17.0	1.0	9.5	34.3
Visual Resource Management Zone							
I	0.0	0.0	0.0	0.0	0.0	0.0	0.0
II	14.5	0.0	0.0	6.0	0.0	0.0	19.3
III	14.0	31.5	36.5	22.0	12.6	20.1	17.0
IV and V	93.0	100.2	103.2	103.7	37.0	30.0	4.8
Highway Crossings							
Number	6	6	3	3	3	4	4
ADT	7,870	11,020	7,130	5,840	9,775	14,775	18,215
Recreation Sites (existing visual contrast)							
Starvation Lake State Park	M	--	--	--	--	--	--
Brough Reservoir	L	L	--	--	--	--	--
Scenic Loop Road (proposed)	L	--	--	L	--	--	--
Roadless Area (proposed)	L	--	--	L	--	--	--
Summer Homes	--	--	--	--	--	--	--
Gooseberry Campground	--	--	--	--	--	--	--
Lower Gooseberry Res.	--	--	--	--	--	--	--
Skyline Drive	--	--	--	--	--	--	--
Snow Play Area	--	--	--	--	--	--	--
Land Use							
Crosses Rangely Recreation and Public Purposes Application	--	--	5	5	--	--	--
Commercial Timber	--	--	--	--	--	--	--
Off-road Vehicle Closure Area	8.0	--	--	8.0	--	--	--
Existing Coal Operations	--	--	--	--	--	--	
Urban Area	--	--	--	--	1.0	1.0	6.0

[a]All numbers indicate miles of transmission right-of-way (ROW) except where noted.

[b]The area is historic habitat for the peregrine falcon (endangered) and blackfooted ferret (endangered), however, they are not presently found in the project area.

[c]Not available.

TABLE 3-27, Section A (continued)

Bonanza or Rangely Plant Site			Bonanza--138-kV System via.		
Price Canyon-Water Hollow--345-kV via:				Bonanza-Rangely	Bonanza-Rangely
Eccles Canyon	Sowers Canyon/Dairy Fork	Sowers Cyn/Thistle Cyn	Bonanza-Vernal	Little Bonanza	Mellen Hill
22.2	6.0	6	0.0	0.0	1.5
11.5	43.5	43.5	9.8	11.5	11.7
5.8	2.0	5.5	15.7	6.0	12.5
22.1	26.5	11.2	7.2	8.5	12.5
17.4	19.0	29.0	11.0	9.0	13.2
--	6.0	14.8	7.3	0.0	0.0
--	0.0	--	0.0	0.0	0.0
10.7	0.0	--	0.0	0.0	0.0
5.0	27.0	49.3	3.0	0.0	3.0
23.8	24.5	11.2	22.5	17.5	22.7
3	2	1	3[c]	1	2
5,785	5,850	4,075		285	2,285
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
M	--	--	--	--	--
M	--	--	--	--	--
L	--	--	--	--	--
L	--	--	--	--	--
L	--	--	--	--	--
--	--	--	--	2	--
5.7	--	--	--	--	--
--	--	--	--	--	--
1.0	--	--	--	--	--
--	--	--	--	2.0	3.0

(continued)

TABLE 3-27 (continued)

Section B
Rangely Unit 1 Routing Alternatives

Resource Category	Rangely to Tank Hollow--345-138-kV Combined System via. Upalco-Fruitland	Upalco-Sowers	Castle Pk.-Sowers	Castle Pk-Fruitland	Rangely--138-kV System Rangely-Vernal	Rangely-Rangely Sub.
Soil Erosion Hazard						
Moderate	107.4	105.4	119.7	122.7	54.3	15.5
Severe	45.0	57.0	57.0	45.0	--	--
Paleontology						
High	105.7	93.7	110.2	124.2	26.0	--
Moderate	10.0	37.0	27.0	--	24.0	15.5
Low	1.0	1.0	--	--	4.3	--
Negligible	5.0	--	2.5	7.5	--	--
Vegetation Types						
Cold Desert	81.9	87.9	122.3	114.3	29.0	8.0
Pinyon-Juniper	30.0	34.0	30.5	30.5	17.0	7.5
Forest	9.0	9.5	7.0	8.0	1.0	--
Mountain Brush	11.5	14.0	11.9	9.4	5.0	--
Cultivated	20.0	17.0	5.0	6.5	2.3	--
Riparian (No. of crossings)	5	3	13	14	--	3
Threatened and Endangered Species Habitat	9.5	19.5	43.5	58.0	2.0	--
Animal Life Habitat						
Terrestrial						
Antelope	0.0	0.0	4.0	4.0	0.0	--
Deer	72.9	63.4	64.0	45.5	20.0	--
Elk	23.0	40.0	40.0	23.0	--	--
Sage Grouse	26.5	46.0	64.0	44.0	10.0	15.5
Golden Eagle	5.0	--	--	5.0	--	--
Wild Horse	16.0	16.0	63.0	46.0	16.0	--
Waterfowl	10.0	3.9	24.0	28.0	1.0	9.0
Threatened and Endangered						
Whooping Crane	2.0	2.0	--	--	--	--
Bald Eagle	7.0	2.0	24.0	26.0	1.0	9.0
Aquatic (No. of crossings)						
Threatened and Endangered	2	2	4	4	1	1
Trout						
Critical	1	--	--	--	--	--
High Priority	1	--	--	--	--	--
Substantial	2	4	4	--	--	--
Channel Catfish						
Limited	--	1	1	--	--	--
Cultural Resources (No. of sites)						
Eligible to Listing	2	--	2	--	2	--
Not Eligible	1	1	1	1	1	--
Visual Resource Management						
Scenic Quality						
A	0.0	0.0	0.0	0.0	0.0	0.0
B	35.5	58.5	67.0	31.0	4.0	2.0
C	108.0	95.0	109.7	137.7	50.3	13.5
Visual Zone						
F	52.0	63.0	90.2	83.7	26.3	9.0
M	49.5	58.5	56.5	46.0	9.0	3.0
B	20.5	10.5	23.0	32.0	8.0	0.0
SS	21.5	21.5	7.0	7.0	11.0	3.5
Sensitivity						
H	36.0	22.0	23.5	29.0	14.0	4.0
M	63.5	60.0	47.5	79.5	11.8	7.0
L	44.0	71.5	105.7	60.2	28.5	4.5

(continued)

TABLE 3-27, Section B (continued)

Resource Category	Rangely to Tank Hollow--345-138-kV Combined System via.				Rangely--138-kV System	
	Upalco-Fruitland	Upalco-Sowers	Castle Pk.-Sowers	Castle Pk-Fruitland	Rangely-Vernal	Rangely-Rangely Sub.
Existing Contrast						
L	61.0	53.5	96.0	89.0	19.0	7.5
M	71.5	81.0	70.2	62.7	22.0	8.0
H	11.0	19.0	10.5	17.0	13.3	0.0
Visual Resource Management Zone						
I	0.0	0.0	0.0	0.0	0.0	0.0
II	18.5	0.0	3.5	9.5	0.0	3.5
III	29.0	43.5	38.0	24.5	18.0	2.5
IV and V	96.0	110.0	135.2	134.7	36.3	9.5
Highway Crossings						
Number	9	9	6	4	3	2
ADT	9,890	13,520	9,095	4,765	[c]	1,680
Recreation Sites (existing visual contrast)						
Starvation Lake State Park	M	--	--	--	--	--
Brough Reservoir	L	L	--	--	--	--
Scenic Loop Road (proposed)	L	--	--	L	--	--
Roadless Recreation Area (proposed)	L	--	--	L	--	--
Land Use						
Off-road vehicle closure areas	8.0	--	--	8.0	--	--
Crosses Rangely Recreation and Public Purposes Act Application	--	--	--	--	--	5.0
Urban Area	--	--	4.0	4.0	--	2.0

[a]All numbers indicate miles of transmission right-of-way (ROW) except where noted.

[b]The area is historic habitat for the peregrine falcon (endangered); and blackfooted ferret (endangered), however, they are not present in the project area.

[c]Not available.

(continued)

TABLE 3-27 (continued)

Section C
Unit 2 Routing Alternative

Resource Category	Bonanza-Mountain Green 345-kV via Lone Tree	Upalco-Fruitland	Castle Pk.-Fruitland	Rangely-Mountain Green 345-kV via Lone Tree	Upalco-Fruitland	Castle Pk.-Fruitland	Bonanza or Rangely 345-kV Mountain Green-Ben Lomond	Mona-Ben Lomond
Soil Erosion Hazard								
Slight	--	--	--	--	--	--	5.0	59.7
Moderate	78.4	122.6	120.1	107.2	153.3	157.1	17.0	40.0
Severe	103.5	62.0	62.0	103.5	62.0	62.0	2.0	14.0
Paleontology								
High	51.2	121.6	130.1	73.0	143.4	149.1	2.0	--
Moderate	62.0	22.0	12.0	69.0	30.9	30.0	--	18.5
Low	41.7	9.0	8.0	41.7	9.0	8.0	17.0	95.2
Negligible	27.0	32.0	32.0	27.0	32.0	32.0	5.0	--
Vegetation Types								
Cold Desert	97.3	86.1	101.7	107.7	95.9	120.8	12.5	21.5
Pinyon-Juniper	24.6	23.1	23.5	37.0	38.0	38.5	--	3.0
Forest	40.0	25.0	25.0	41.0	26.0	25.0	5.0	--
Mountain Brush	10.0	25.9	25.9	15.0	30.9	28.8	6.5	--
Culivated	10.0	24.5	6.0	10.0	24.5	6.0	--	78.6
Riparian (No. of crossings)	5	6	7	5	4	14	3	--
Threatened and Endangered Species Habitat	17.0	9.5	40.0	12.0	8.5	38.5	--	--
Wet Meadow (marsh)	12	--	--	12	--	--	--	(10.5)
Animal Life Habitat								
Terrestrial								
Antelope	4.0	4.0	4.0	0	0	4.0	--	--
Deer	50.7	94.4	80.9	60.7	115.8	88.4	8.0	7.0
Elk	65.7	65.9	65.9	65.7	65.9	65.9	8.0	7.0
Moose	56.2	83.8	83.8	56.2	83.8	83.8	--	--
Sage Grouse	38.0	65.4	64.0	48.0	74.5	79.5	--	--
Sharptailed Grouse	--	--	--	13	--	--	--	--
Golden Eagle	--	5.0	5.0	--	5.0	5.0	--	--
Raptor	--	--	--	--	--	5.0	5.0	--
Wild Horse	--	--	42.5	16.0	16.0	46.5	--	--
Waterfowl	27.0	18.5	27.5	27.0	19.4	37.5	--	15.0
Threatened and Endangered								
Whooping Crane	--	2.0	--	--	2.0	--	--	--
Bald Eagle	1.0	5.0	14.0	1.0	5.0	24.0	--	--
Aquatic (No. of crossings)								
Threatened and Endangered	1	1	2	1	2	4	--	--
Trout								
Critical rare	3	--	--	3	--	--	--	--
Critical	4	4	4	4	4	4	2	--
High Priority	4	5	5	4	5	5	5	--
Substantial	2	10	9	2	10	9	--	2
Unclassified	10	--	--	10	--	--	--	--
Limited	--	--	1	--	--	1	--	3
Cultural Resources (No. of sites)								
Eligible for Listing	--	--	--	2	2	--	--	--
Not Eligible	2	--	1	1	1	1	--	--
Visual Resource Management								
Scenic Quality								
A	13.5	0.0	0.0	13.5	0.0	0.0	--	--
B	59.0	88.4	75.4	59.0	86.4	81.9	3.0	--
C	109.4	96.2	106.7	138.2	128.9	137.2	21.0	113.7
Visual Zone								
F	54.7	78.9	108.6	64.7	108.8	125.1	24.0	87.7
M	59.7	70.5	39.5	70.7	60.5	50.0	--	26.0
B	35.5	10.7	20.0	36.3	10.5	23.0	--	--
SS	32.0	24.5	14.0	39.0	35.5	21.0	--	--

(continued)

TABLE 3-27, Section C (concluded)

Resource Category	Bonanza-Mountain Green 345-kV via Lone Tree	Bonanza-Mountain Green 345-kV via Upalco-Fruitland	Bonanza-Mountain Green 345-kV via Castle Pk.-Fruitland	Rangely-Mountain Green 345-kV via Lone Tree	Rangely-Mountain Green 345-kV via Upalco-Fruitland	Rangely-Mountain Green 345-kV via Castle Pk.-Fruitland	Bonanza or Rangely 345-kV Mountain Green-Ben Lomond	Bonanza or Rangely 345-kV Mona-Ben Lomond
Sensitivity								
H	39.5	17.5	8.0	53.5	31.5	12.0	3.0	53.0
M	42.5	112.4	111.4	44.5	121.3	129.9	21.0	42.7
L	99.9	54.7	62.7	111.0	62.5	77.2	--	18.0
Existing Contrast								
L	107.9	61.2	70.0	119.7	65.0	90.0	0.0	5.0
M	63.0	123.4	95.1	74.0	139.3	112.1	0.0	18.0
H	11.0	0.0	17.0	17.0	11.0	17.0	24.0	90.7
Visual Resource Management Zone								
I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
II	24.0	14.5	2.0	24.0	14.5	5.5	3.0	0.0
III	38.5	61.5	67.5	53.5	76.5	70.0	0.0	53.0
IV and V	119.4	108.6	112.6	133.2	124.3	143.6	21.0	60.7
Highway Crossings								
Number	7	4	6	6	13	13	2	19
ADT	13,025	11,780	14,800	13,005	11,780	11,780	11,260	125,395
Recreation Sites (exising visual contrast)								
Lost Creek Res.	L	--	--	L	--	--	--	--
Starvation Lake State Park	--	M	--	--	M	--	--	--
Red Cloud Loop Rd.	L	--	--	L	--	--	--	--
Strawberry Lake State Park	--	M	M	--	M	M	--	--
Rockport Lake and C.G.	--	L	L	--	L	L	--	--
Merkley Park	L	--	--	L	--	--	--	--
Echo Reservoir	--	M	M	--	M	M	--	--
Remember the Maine C.P.	L	--	--	L	--	--	--	--
Brough Reservoir	--	L	--	--	L	--	--	--
Land Use								
Cross Rangely Recreation and Public Purposes Act Application	--	--	--	--	--	7.0	--	--
Urban Area	6.0	--	--	6.0	--	4.0	19.0	43.7
Commercial timber areas.	29.5	--	--	29.5	--	--	--	--
U.S. Forest Service Off-road Vehicle Closure Area	12.0	--	--	12.0	--	--	--	--
Conflict with Vernal Planning Unit Land Use Plan	29.5	--	--	29.5	--	--	--	--

[a]All numbers indicate miles of transmission right-of-way (ROW) except where noted.

[b]The area is historic habitat for the peregrine falcon (endangered) and blackfooted ferret (endangered); however, they are not presently found in the project area.

[c]Not available.

LINEAR PROFILE KEY

The following are environmental profiles of the transmission system routing alternatives. The mileposts correlate with those in the pocket map located at the end of the book. To determine the environment of a milepost in the pocket map, find the corresponding segment and milepost on the following profiles and read the environment from the bars below the milepost.

VEGETATION
- C Cultivated
- CD Cold Desert Shrub
- F Forest
- MB Mountain Brush
- PJ Pinyon-Juniper
- R Riparian Crossing
- WM Wetland/Marsh

THREATENED OR ENDANGERED (T&E) PLANT/HABITAT
- H T&E Habitat
- HP T&E Potential Habitat

SOIL TYPES
1. Clay with Shale
2. Loamy Skeletal
3. Mountain Loam with Upland Clay
4. Mountain Loam with Meadow Clay
5. Shallow Shale with Loam
6. Desert Loam with Shallow Shale
7. Desert Flats with Sandy Loam
8. Mountain Stony Loam

EROSION HAZARD
1. Slight
2. Moderate
3. Severe

VISUAL ZONE
- H High
- M Medium
- L Low
- F Foreground
- M Middleground
- B Background
- SS Seldom Seen

SENSITIVITY
- H High
- M Medium
- L Low

EXISTING CONTRAST
- H High
- M Medium
- L Low

LAND USE
- U Urban
- A Agriculture
- R Range
- F Forest

LAND OWNERSHIP
- A U.S. Army
- BLM or B Bureau of Land Management
- FS Forest Service
- I Indian
- P Private
- S State
- M Multiple Ownership

VISUAL RESOURCE MANAGEMENT CLASS
- I Protection - Ecological changes only
- II Retention - Changes should not be evident
- III Partial Retention - Changes should be subordinate to landscape character
- IV Modification Allowed - Changes may subordinate landscape character
- V Rehabilitation - Needs corrective change

PLANNING UNIT BY NAME

POLITICAL SUBDIVISION BY NAME

SPECIAL ANIMALS
1. Critical Aquatic T&E Habitat
2. Critical Habitat for Rare Colorado Cutthroat Trout
- BE Bald Eagle (endangered)
- GE Golden Eagle (nesting area)
- H Wild Horse (critical area)
- R Raptor Area (migitation area)
- WC Whooping Crane (endangered) Flyway

GAME ANIMALS
3. Critical Trout Habitat
4. High Priority Trout Habitat
5. Substantial Trout Habitat
6. Limited Trout Habitat
7. Limited Channel Catfish Habitat
- A Antelope (fawning area)
- D Deer (critical area)
- E Elk (critical area)
- W Waterfowl
- M Moose (critical area)
- SG Sage Grouse (critical area)
- ST Sharptail Grouse (critical area)

CULTURAL RESOURCES
- ( ) No. eligible for National Register

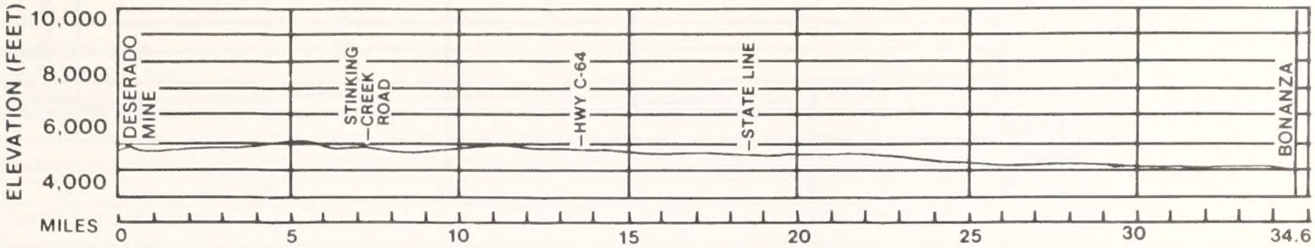
PALEONTOLOGICAL RESOURCES
- H Potentially High Significance
- M Potentially Medium Significance
- L Low Significance
- N Negligible Significance

Transmission System Alternative Segments

Segment Number[a]	From	To	Length (miles)
1	Bonanza	Little Bonanza	6.2
2	Little Bonanza	Rangely substation	17.5
3	Bonanza	Mellen Hill	16.0
4	Mellen Hill	Rangely substation	9.7
5	Bonanza	Deadman Bench	4.2
6	Deadman Bench	Stirrup	15.0
7	Stirrup	Upalco	31.0
8	Upalco	Arcadia	4.0
9	Arcadia	Sinkdraw	22.5
10	Sinkdraw	Fruitland	15.0
11	Fruitland	Tank Hollow	30.0
12	Bonanza	Coyote Wash	3.5
13	Coyote Wash	Castle Peak	39.0
14	Castle Peak	South Myton	3.2
15	South Myton	Sink Draw	28.5
16	South Myton	Upalco	12.5
17	Arcadia	Sowers Canyon	12.5
18	Castle Peak	Sowers Canyon	16.5
19	Sowers Canyon	Tank Hollow	65.0
20	Tank Hollow	Thistle	8.8
21	Thistle	Spanish Fork substation	7.5
22	Spanish Fork substation	Mona substation	24.8
23	Thistle	Mud Flat	15.5
24	Mud Flat	Mona substation	25.8
25	Tank Hollow	Mud Flat	23.8
26	Rangely	Red Wash	41.0
27	Red Wash	Stirrup	8.9
28	Rangely	Rangely substation	15.5
29	Little Bonanza	Coyote Wash	8.9
30	Fruitland	Mountain Green	92.9
31	Mountain Green	Ben Lomond	24.0
32	Deadman Bench	Red Wash	8.0
33	Red Wash	Asphalt Ridge	9.0
34	Asphalt Ridge	Vernal substation	4.3
35	Asphalt Ridge	Mountain Green (via Lone Tree)	160.7
36	Mona substation	Ben Lomond	113.7
37	Price Canyon	Water Hollow (via Eccles Canyon)	39.5

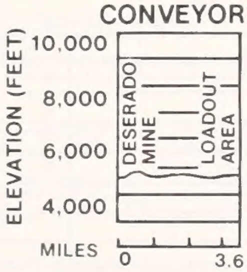
[a]Segment numbers correlate with the pocket map located in the back of the book.

BONANZA SITE
RAILROAD/OFF-ROAD TRUCK HAUL



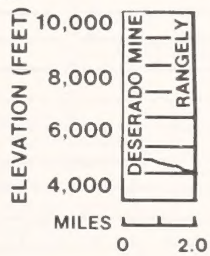
VEGETATION	CD
T&E PLANTS/HABITAT	6
SOIL TYPES	2
EROSION HAZARD	
SCENIC QUALITY	C / B / C
VISUAL ZONE	M / F / M / F / M / F / M / F / M
SENSITIVITY	M / H / L / H / M / L
EXISTING CONTRAST	M / L
LAND USE	RANGE
LAND OWNERSHIP	BLM / PRIVATE / B / S / BLM / P / B / P / BLM / P / BLM / S / BLM / S
VRM CLASS	IV / III / IV / III / IV
PLANNING UNIT	REGION 11 / UINTAH
A.O.S.C.	
POLITICAL SUB.	RIO BLA / MOFFAT / RIO BLANCO / UINTAH
SPECIAL ANIMALS	
GAME ANIMALS	D / / D / / SG / / A
CULTURAL RESOURCES	NONE / 1
PALEONTOLOGICAL RESOURCES	M / L / M / L / H / L / H / L / H

BONANZA SITE
RAILROAD
COAL DELIVERY
CONVEYOR



VEGETATION	CD PJ
T&E PLANTS/HABITAT	
SOIL TYPES	6
EROSION HAZARD	2
SCENIC QUALITY	C
VISUAL ZONE	M
SENSITIVITY	M
EXISTING CONTRAST	L
LAND USE	RANGE
LAND OWNERSHIP	BLM
VRM CLASS	IV
PLANNING UNIT	REGION II
A.O.S.C.	
POLITICAL SUB.	RIO BLAN
SPECIAL ANIMALS	
GAME ANIMALS	/ A SG
CULTURAL RESOURCES	1
PALEONTOLOGICAL RESOURCES	

RANGELY SITE
OVERLAND
CONVEYOR

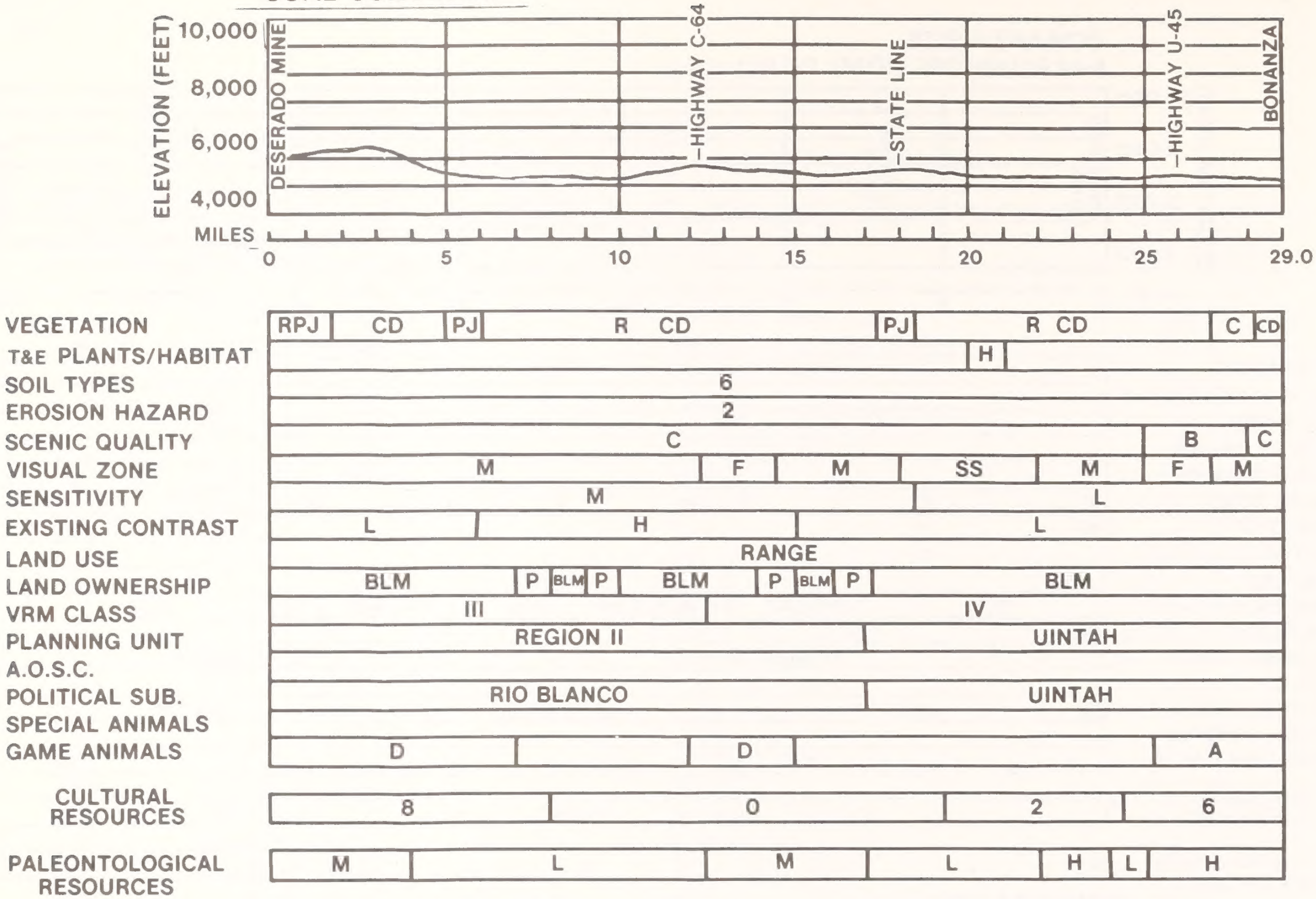


VEGETATION	CD,PJ
E&T PLANTS/HABITAT	
SOIL TYPES	b
EROSION HAZARD	2
SCENIC QUALITY	C
VISUAL ZONE	M
SENSITIVITY	M
EXISTING CONTRAST	L
LAND USE	RANGE
LAND OWNERSHIP	BLM
VRM CLASS	IV
PLANNING UNIT	REGION II
A.O.S.C.	
POLITICAL SUB.	RIO BLANCO
SPECIAL ANIMALS	
GAME ANIMALS	D / D,SG
CULTURAL RESOURCES	I
PALEONTOLOGICAL RESOURCES	M

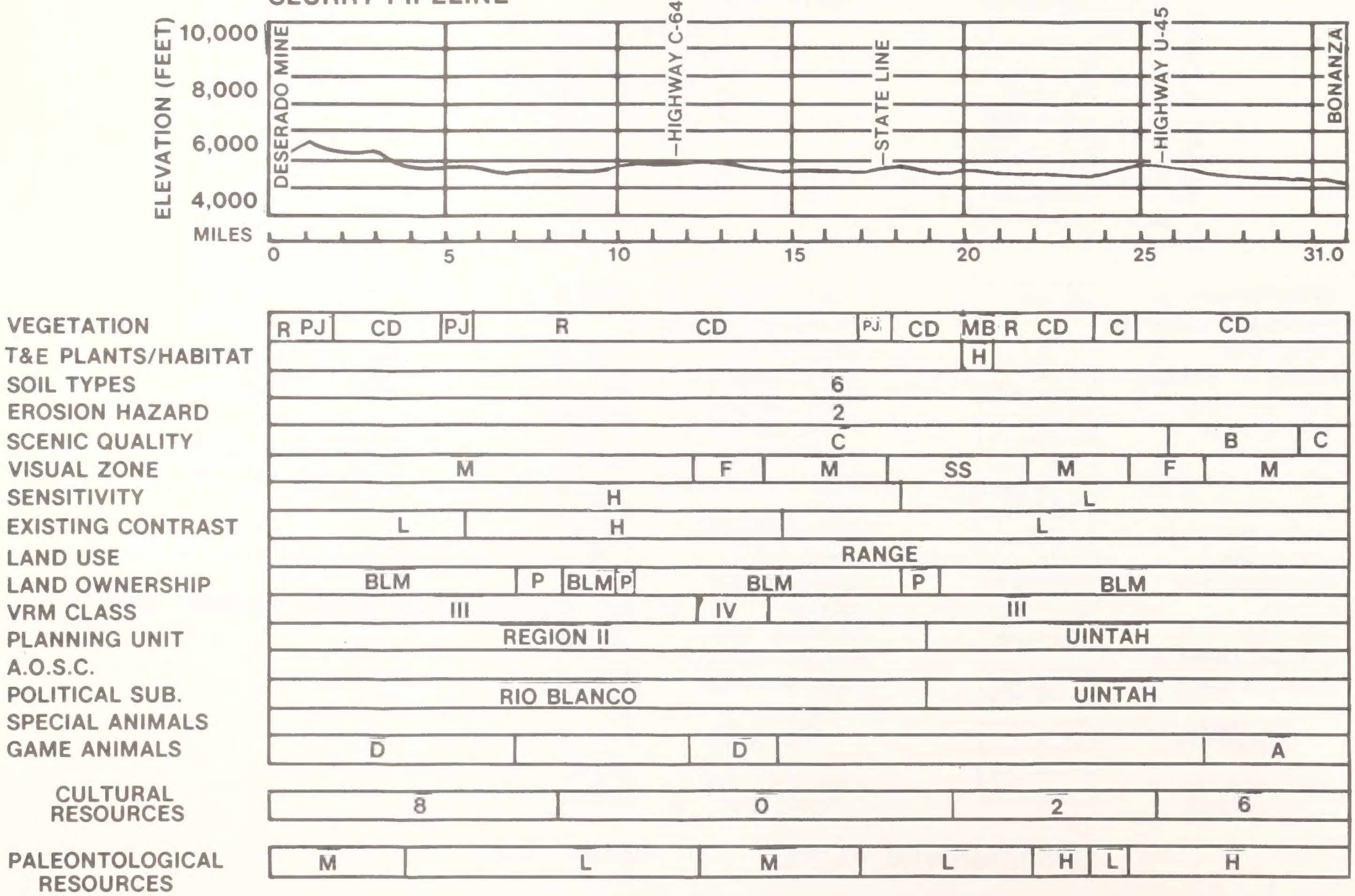
ENVIRONMENTAL PROFILE FIGURE 3-8

COAL AND WATER TRANSPORT ALTERNATIVES

BONANZA SITE
COAL CONVEYOR

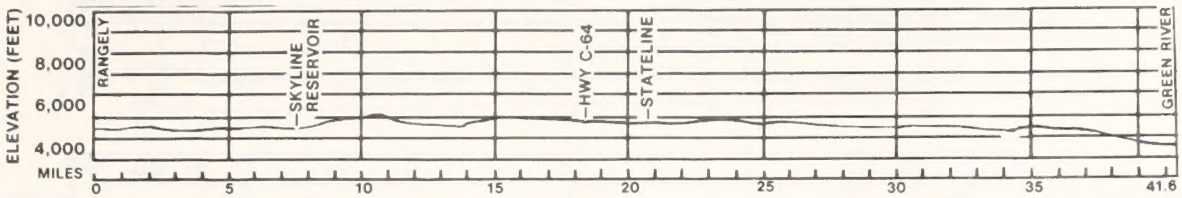


BONANZA SITE
SLURRY PIPELINE



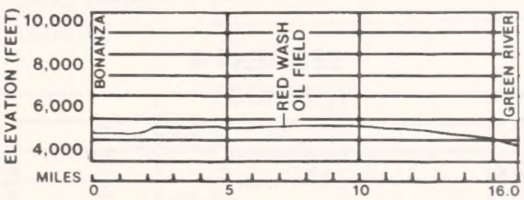
ENVIRONMENTAL PROFILE FIGURE 3-9

RANGELY SITE
WATER PIPELINE



VEGETATION	CD / R / CD / R
T&E PLANTS/HABITAT	
SOIL TYPES	3 / 6
EROSION HAZARD	3 / 2
SCENIC QUALITY	C / B
VISUAL ZONE	M / F
SENSITIVITY	M / H / L
EXISTING CONTRAST	M / H / L
LAND USE	RANGE / AGRI
LAND OWNERSHIP	BLM / P / B / P / B / P / B / S / B / P / BLM / P
VRM CLASS	IV / III / IV / III
PLANNING UNIT	REGION II / UINTAH
A.O.S.C.	
POLITICAL SUB.	RIO BLANCO / MOFFAT / RIO BLANCO / UINTAH
SPECIAL ANIMALS	
GAME ANIMALS	
CULTURAL RESOURCES	0 / 1 / 0
PALEONTOLOGICAL RESOURCES	M / L / M / L / M / H / L

BONANZA SITE
WATER PIPELINE

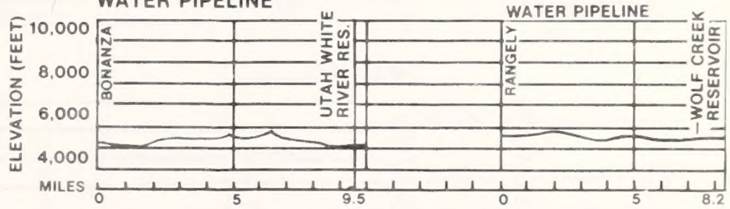


VEGETATION	CD / PJ / CD / PJ / CDR
T&E PLANTS/HABITAT	H
SOIL TYPES	6
EROSION HAZARD	2
SCENIC QUALITY	C / B
VISUAL ZONE	BG / M
SENSITIVITY	L / M
EXISTING CONTRAST	L / H / L
LAND USE	RANGE
LAND OWNERSHIP	BLM / S / BLM
VRM CLASS	IV / V / IV / III
PLANNING UNIT	UINTAH
A.O.S.C.	
POLITICAL SUB.	UINTAH
SPECIAL ANIMALS	
GAME ANIMALS	A
CULTURAL RESOURCES	0 / 1 / 0 / 1
PALEONTOLOGICAL RESOURCES	H / L / M / L / M / H / L / H / L

ENVIRONMENTAL PROFILE

BONANZA SITE
WATER PIPELINE

RANGELY SITE
WATER PIPELINE

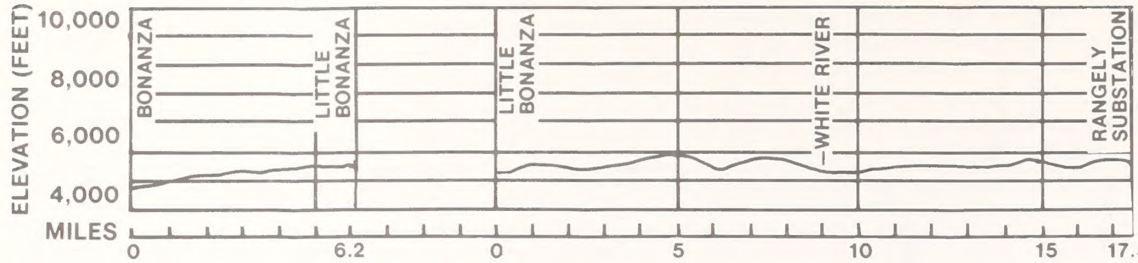


	Bonanza Site	Rangely Site
VEGETATION	R / CD / R	CD, PJ
E&T PLANTS/HABITAT	H	
SOIL TYPES	6	3 / 1
EROSION HAZARD	2	3
SCENIC QUALITY	C / B	C / B
VISUAL ZONE	M / F	F
SENSITIVITY	L / M	M / H
EXISTING CONTRAST	L	L
LAND USE	RANGE / AGR	RANGE / AGRI
LAND OWNERSHIP	BLM	BLM / PRIVATE
VRM CLASS	IV / III	III / II
PLANNING UNIT	UINTAH	REGION II
A.O.S.C.		
POLITICAL SUB.		RIO BLANCO
SPECIAL ANIMALS	H	
GAME ANIMALS	D / D,SG / D	
CULTURAL RESOURCES	0 / 3(1)	0
PALEONTOLOGICAL RESOURCES	H	M / L

ENVIRONMENTAL PROFILE

FIGURE 3-10

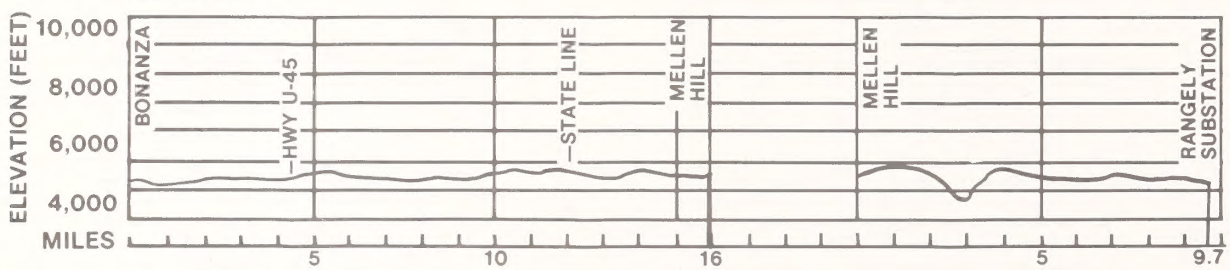
SEGMENT 1 SEGMENT 2



	Segment 1	Segment 2
VEGETATION	R, CD	CD, R, PJ, R, CD, PJ
T&E PLANTS/HABITAT	PH	
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C	B, C
VISUAL ZONE	M, F	M, B, SS, M
SENSITIVITY	L	L, M
EXISTING CONTRAST	M	L to M
LAND USE	RANGE	RANGE, URBAN
LAND OWNERSHIP	BLM	BLM, P, BLM, P, BLM
VRM CLASS	IV	V, IV, V
PLANNING UNIT	UINTAH	UINTAH, REGION 11
A.O.S.C.		R&PP APPLICATION
POLITICAL SUB.	UINTAH	UINTAH, RIO BLANCO
SPECIAL ANIMALS	H	BE,1, 1, M
GAME ANIMALS	A	D,W
CULTURAL RESOURCES		
PALEONTOLOGICAL RESOURCES	H	H

1 2

SEGMENT 3 SEGMENT 4



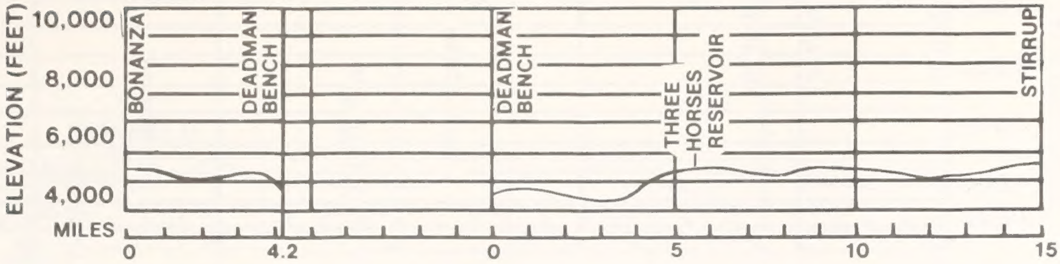
	Segment 3	Segment 4
VEGETATION	CD	CD
T&E PLANTS/HABITAT	H	H
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C, B, C	C
VISUAL ZONE	B, M, F, M, B, F, SS, F	F
SENSITIVITY	M, L, H, M	M
EXISTING CONTRAST	L to M	L to M
LAND USE	RANGE	RANGE, URBAN, RANGE
LAND OWNERSHIP	BLM, P, BLM	BLM, PRIVATE
VRM CLASS	IV, III, IV, V, III, IV	IV
PLANNING UNIT	UINTAH, REGION 11	REGION 11
A.O.S.C.		
POLITICAL SUB.	UINTAH, RIO BLANCO	RIO BLANCO
SPECIAL ANIMALS	H	1
GAME ANIMALS	A	7W
CULTURAL RESOURCES		
PALEONTOLOGICAL RESOURCES	H, M	M

3 4

ENVIRONMENTAL PROFILE FIGURE 3-11

TRANSMISSION SYSTEM ALTERNATIVE SEGMENTS

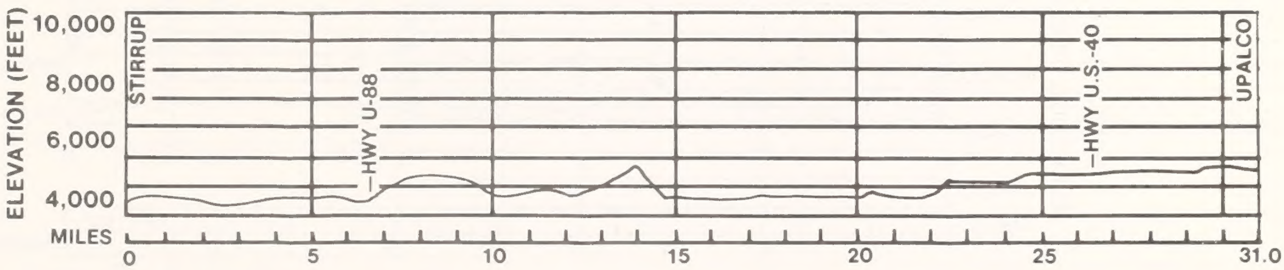
SEGMENT 5 SEGMENT 6



	Segment 5	Segment 6
VEGETATION	CD / PJ	CD
T&E PLANTS/HABITAT	H	
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C	C / B / C
VISUAL ZONE	B	F / M / F / SS
SENSITIVITY	L	L
EXISTING CONTRAST	L	L
LAND USE	RANGE	RANGE
LAND OWNERSHIP	BLM	BLM
VRM CLASS	IV	V / IV / V / IV
PLANNING UNIT	UINTAH	UINTAH
A.O.S.C.		
POLITICAL SUB.	UINTAH	UINTAH
SPECIAL ANIMALS		
GAME ANIMALS	A	
CULTURAL RESOURCES		
PALEONTOLOGICAL RESOURCES	H	H / M

5 6

SEGMENT 7

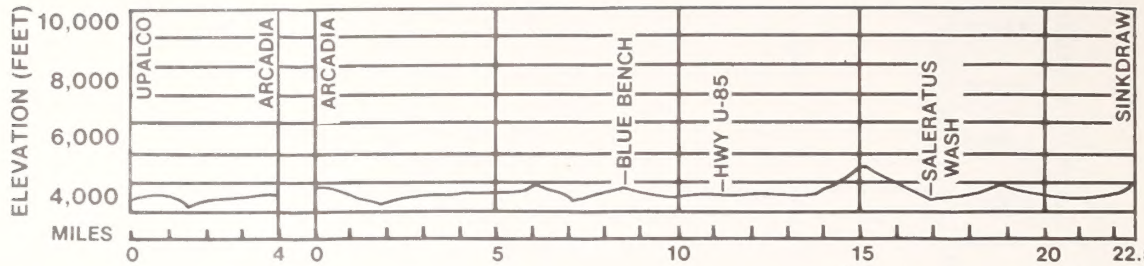


	Segment 7
VEGETATION	R / CD / C / CD / R / C / CD / C / CD / C / CD
T&E PLANTS/HABITAT	H
SOIL TYPES	6
EROSION HAZARD	2
SCENIC QUALITY	B / C
VISUAL ZONE	SS / B / F / M
SENSITIVITY	L / M
EXISTING CONTRAST	L / M
LAND USE	RANGE / AGRI-CULTURE / RANGE / AGRICULTURE
LAND OWNERSHIP	BLM / S / BLM / P / BL / P / BL / P / INDIAN / P / I / P / I / P / I / PRIVATE / INDIAN / STATE
VRM CLASS	IV
PLANNING UNIT	UINTAH / UINTA BASIN
A.O.S.C.	
POLITICAL SUB.	UINTAH / DUCHESNE
SPECIAL ANIMALS	
GAME ANIMALS	$W_2D_2$1BE
CULTURAL RESOURCES	
PALEONTOLOGICAL RESOURCES	H

7

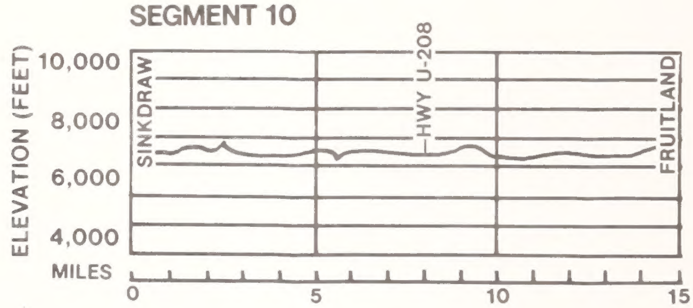
ENVIRONMENTAL PROFILE FIGURE 3-12

SEGMENT 8 SEGMENT 9



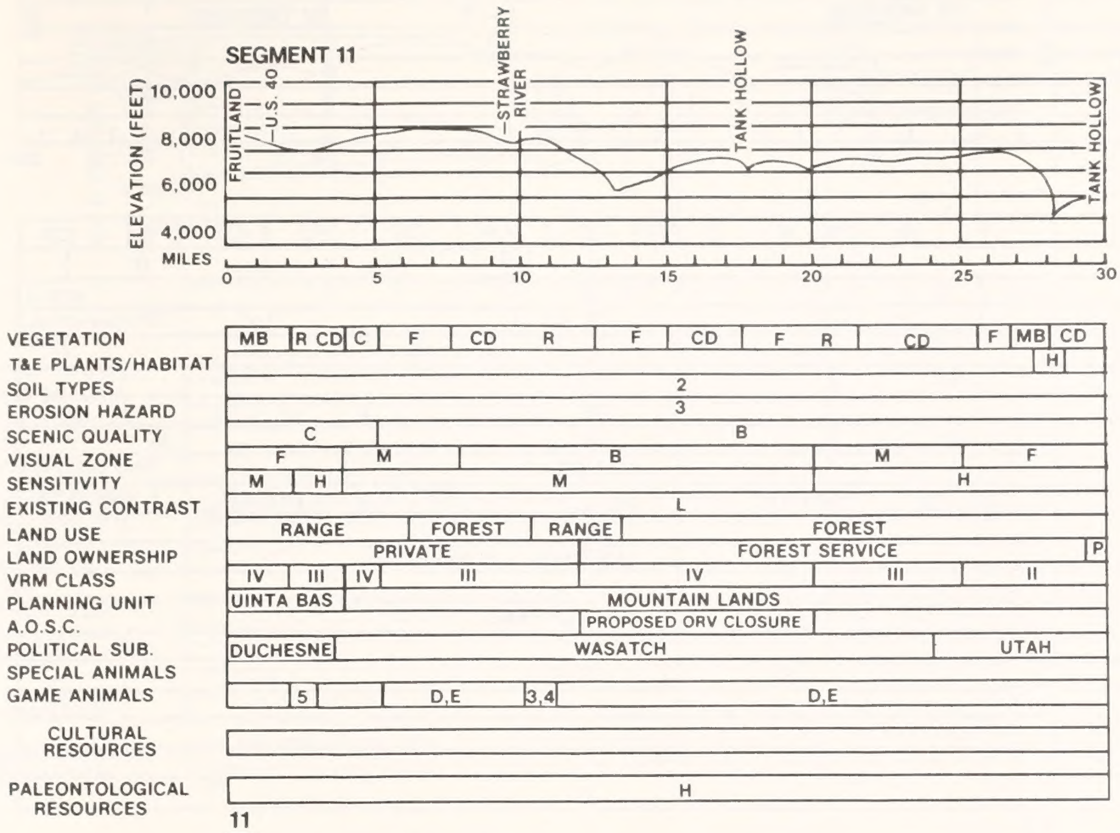
	8	9
VEGETATION	CD / C	CD / C / CD / PJ / CD
T&E PLANTS/HABITAT	H	H
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C	C / B
VISUAL ZONE	F	M / F
SENSITIVITY	M	L / H
EXISTING CONTRAST	M	M
LAND USE	AGRICULT / RANGE	AGRI / RANGE
LAND OWNERSHIP	P / I	I / PRIVATE
VRM CLASS	IV	IV / II
PLANNING UNIT	UINTAH BASIN	UINTAH BASIN
A.O.S.C.		
POLITICAL SUB.	DUCHESNE	DUCHESNE
SPECIAL ANIMALS		BE / BE
GAME ANIMALS		W / D / W,D / D / S / D
CULTURAL RESOURCES		
PALEONTOLOGICAL RESOURCES	H	H

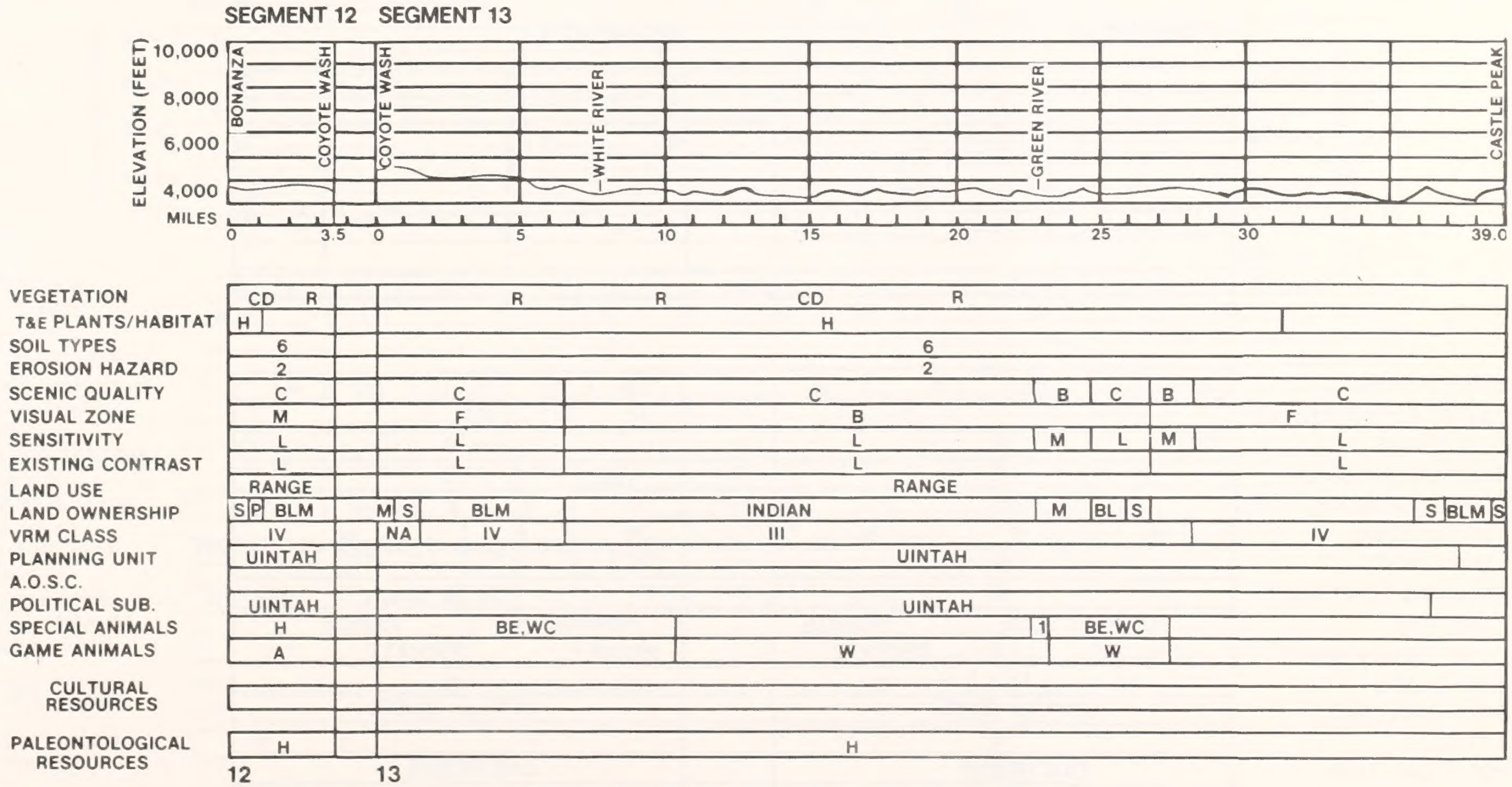
SEGMENT 10



	10
VEGETATION	CD / PJ / R / CD / MB / CD / PJ / C
T&E PLANTS/HABITAT	
SOIL TYPES	2
EROSION HAZARD	3
SCENIC QUALITY	C
VISUAL ZONE	F
SENSITIVITY	M
EXISTING CONTRAST	M
LAND USE	RANGE
LAND OWNERSHIP	PRIVATE
VRM CLASS	IV
PLANNING UNIT	UINTA BASIN
A.O.S.C.	
POLITICAL SUB.	DUCHESNE
SPECIAL ANIMALS	GE / GE,BE / GE
GAME ANIMALS	D / D,SG / DSG / W / DSG
CULTURAL RESOURCES	
PALEONTOLOGICAL RESOURCES	H / N / H

ENVIRONMENTAL PROFILE FIGURE 3-13

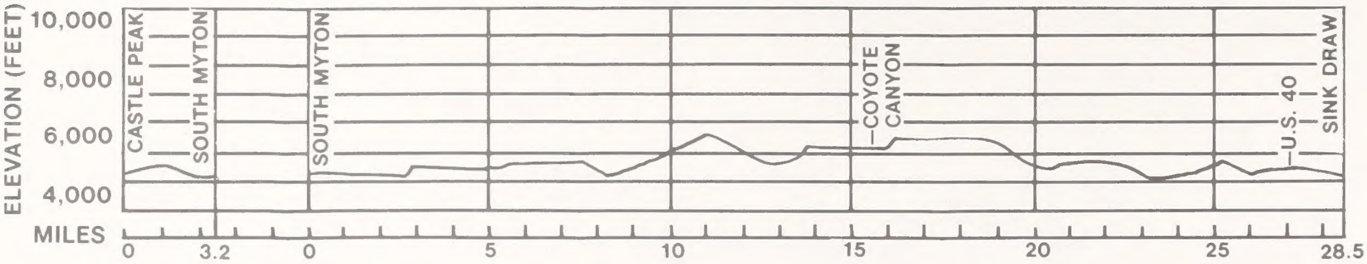




ENVIRONMENTAL PROFILE

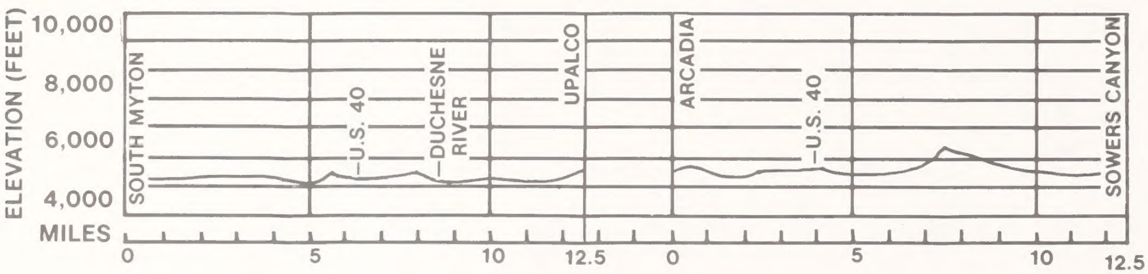
FIGURE 3-14

SEGMENT 14 SEGMENT 15



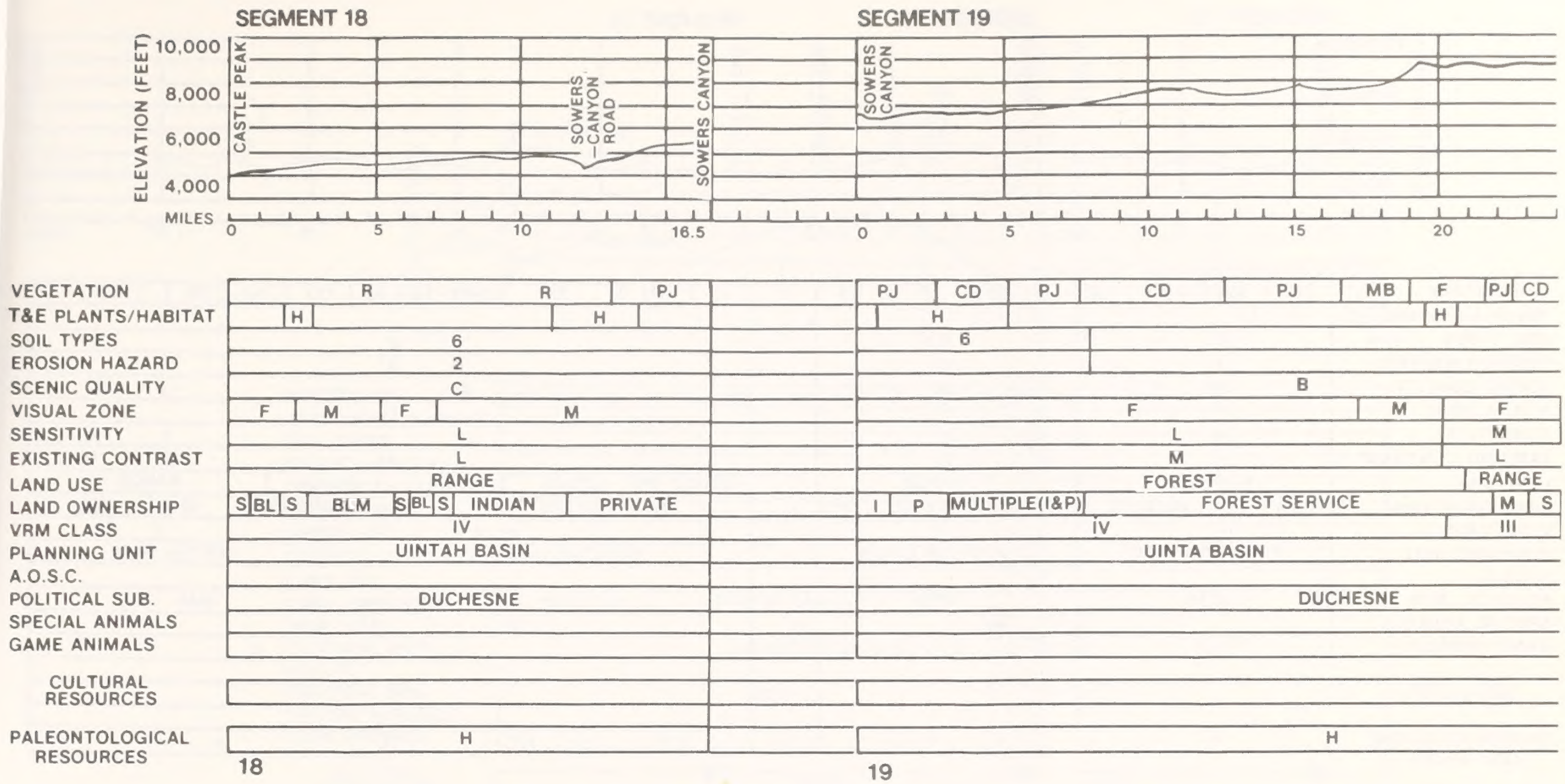
	14	15
VEGETATION	CD	R CD R | PJ | CD | PJ | CD | PJ | CD | PJ | CD
T&E PLANTS/HABITAT		H | H | H
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C	C
VISUAL ZONE	F	M | F
SENSITIVITY	L	M | H
EXISTING CONTRAST	M	M | H | M
LAND USE	AGRICULTURE	RANGE
LAND OWNERSHIP	BLM	PRIVATE | I | P | INDIAN | PRIVATE
VRM CLASS	IV	IV
PLANNING UNIT	UINTAH	UINTAH
A.O.S.C.		
POLITICAL SUB.	UINTAH	DUCHESNE
SPECIAL ANIMALS		
GAME ANIMALS		6 | S,G
CULTURAL RESOURCES		
PALEONTOLOGICAL RESOURCES	H	H

SEGMENT 16 SEGMENT 17



	16	17
VEGETATION	C R | CD R | C	CD | PJ | F | C | CD | PJ
T&E PLANTS/HABITAT	H	H | H
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C	C
VISUAL ZONE	M | F | M	M | F | M
SENSITIVITY	H	L | M | L
EXISTING CONTRAST	M	M
LAND USE	AGRICULTURE | RANGE	AGRICULTURE | RANGE
LAND OWNERSHIP	PRIVATE | I | PRIVATE	INDIAN | PRIVATE
VRM CLASS	IV | III | IV	IV
PLANNING UNIT	UINTAH BASIN	UINTAH BASIN
A.O.S.C.		
POLITICAL SUB.	DUCHESNE	DUCHESNE
SPECIAL ANIMALS		
GAME ANIMALS	7	W,7
CULTURAL RESOURCES	NONE	
PALEONTOLOGICAL RESOURCES	H | N	H

ENVIRONMENTAL PROFILE FIGURE 3-15


SEGMENT 18
SEGMENT 19
ELEVATION (FEET)
10,000
8,000
6,000
4,000
MILES
CASTLE PEAK
SOWERS —CANYON ROAD
SOWERS CANYON
0
5
10
16.5
15
20
VEGETATION
T&E PLANTS/HABITAT
SOIL TYPES
EROSION HAZARD
SCENIC QUALITY
VISUAL ZONE
SENSITIVITY
EXISTING CONTRAST
LAND USE
LAND OWNERSHIP
VRM CLASS
PLANNING UNIT
A.O.S.C.
POLITICAL SUB.
SPECIAL ANIMALS
GAME ANIMALS
CULTURAL RESOURCES
PALEONTOLOGICAL RESOURCES
R R PJ
H H
6
2
C
F M F M
L
L
RANGE
S BL S BLM S BL S INDIAN PRIVATE
IV
UINTAH BASIN
DUCHESNE
H
18
PJ CD PJ CD PJ MB F PJ CD
H H
6
B
F M F
L M
M L
FOREST RANGE
I P MULTIPLE(I&P) FOREST SERVICE M S
IV III
UINTA BASIN
DUCHESNE
H
19

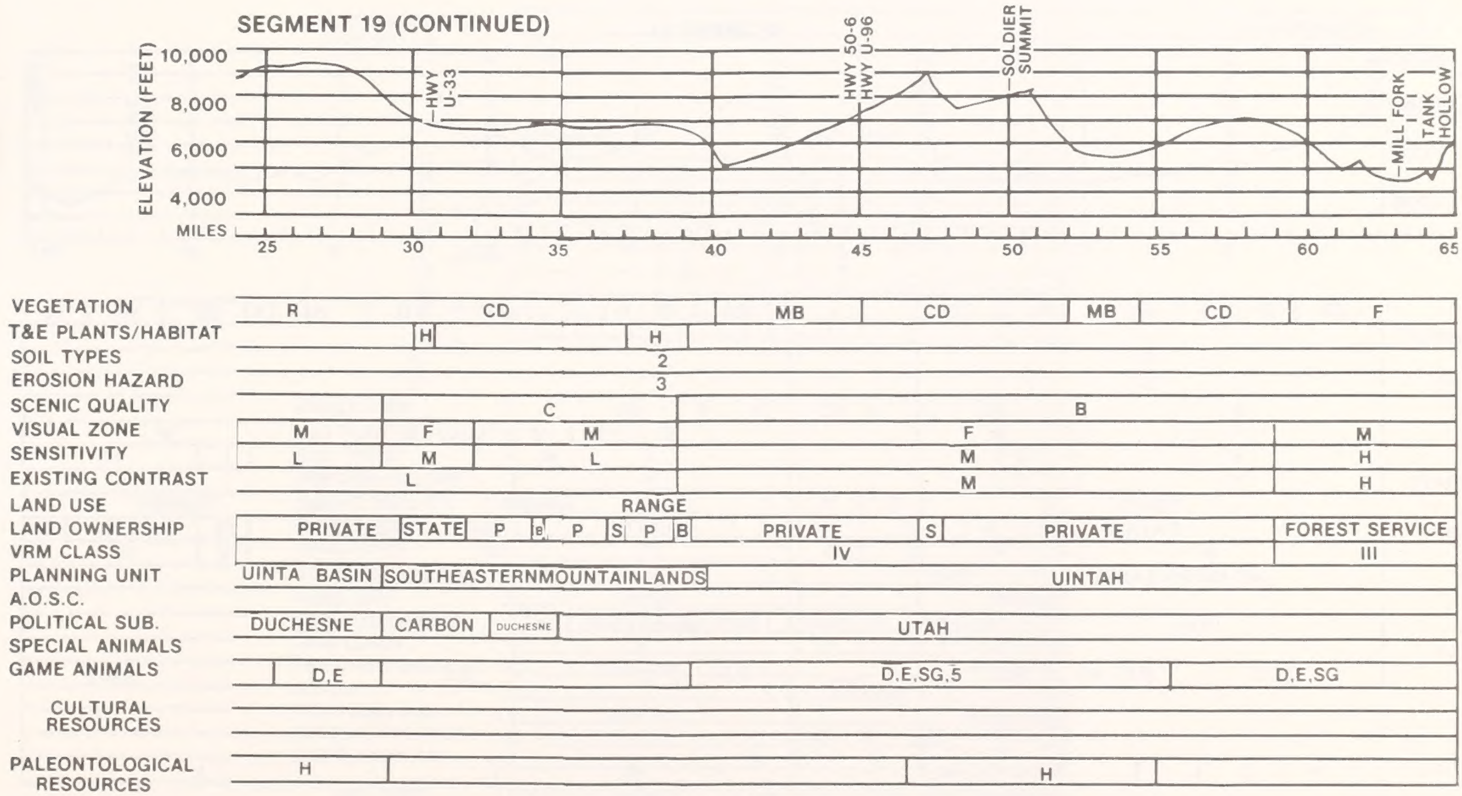
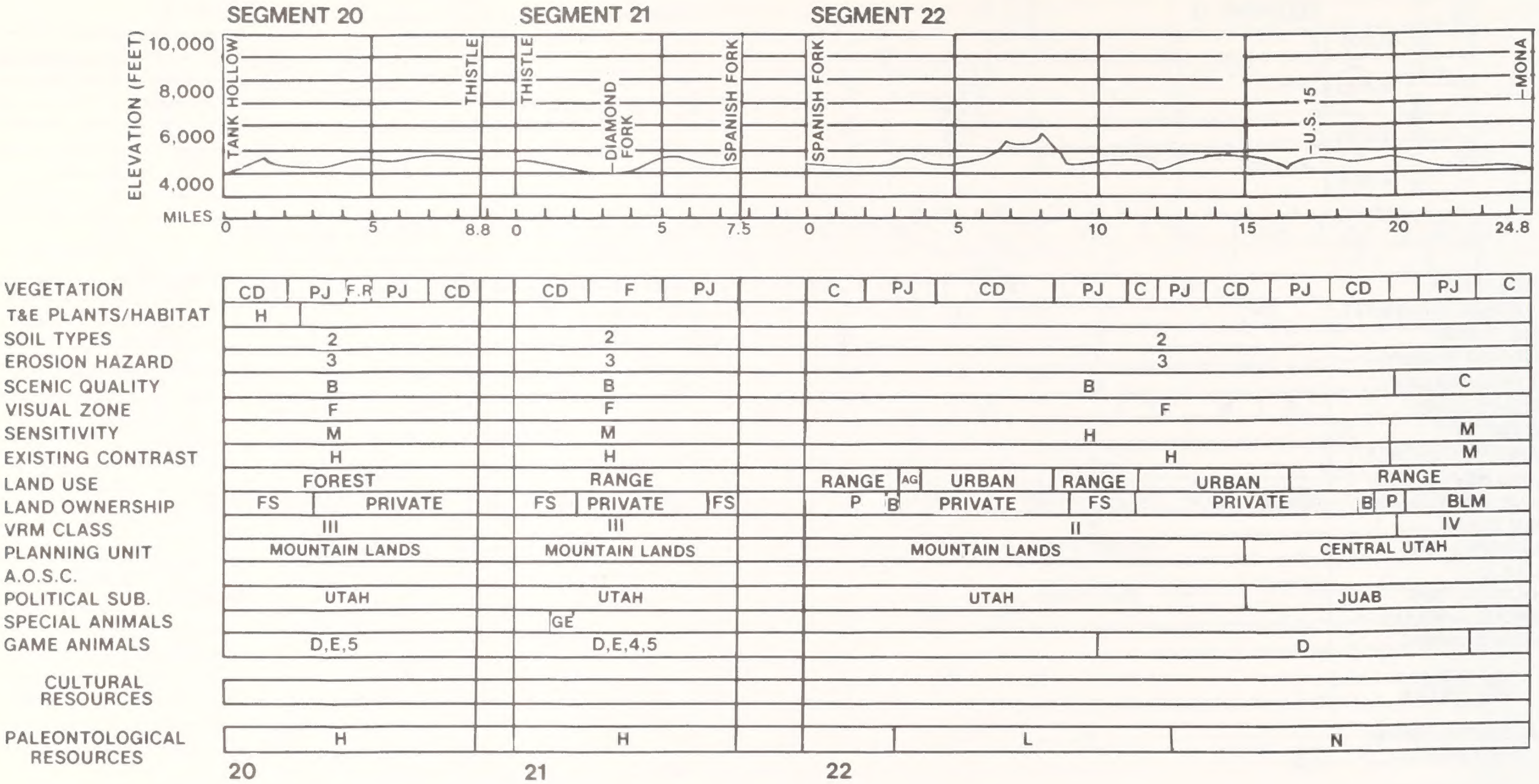
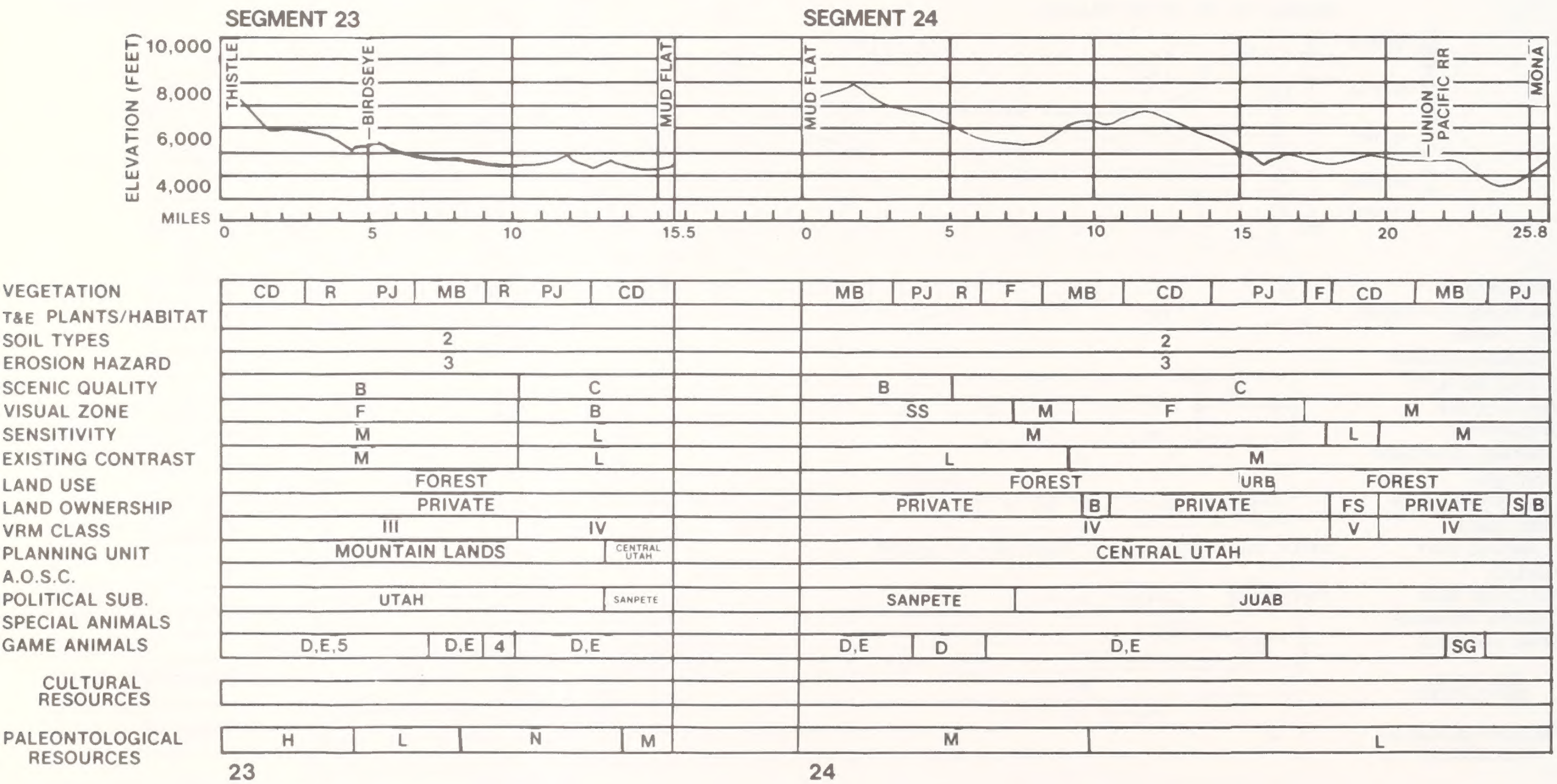

SEGMENT 19 (CONTINUED)
ELEVATION (FEET)
10,000
8,000
6,000
4,000
MILES
—HWY U-33
HWY 50-6 HWY U-96
—SOLDIER SUMMIT
—MILL FORK
TANK HOLLOW
25
30
35
40
45
50
55
60
65
VEGETATION
T&E PLANTS/HABITAT
SOIL TYPES
EROSION HAZARD
SCENIC QUALITY
VISUAL ZONE
SENSITIVITY
EXISTING CONTRAST
LAND USE
LAND OWNERSHIP
VRM CLASS
PLANNING UNIT
A.O.S.C.
POLITICAL SUB.
SPECIAL ANIMALS
GAME ANIMALS
CULTURAL RESOURCES
PALEONTOLOGICAL RESOURCES
R CD MB CD MB CD F
H H
2
3
C B
M F M F M
L M L M H
L M H
RANGE
PRIVATE STATE P B P S P B PRIVATE S PRIVATE FOREST SERVICE
IV III
UINTA BASIN SOUTHEASTERNMOUNTAINLANDS UINTAH
DUCHESNE CARBON DUCHESNE UTAH
D,E D,E,SG,5 D,E,SG
H H

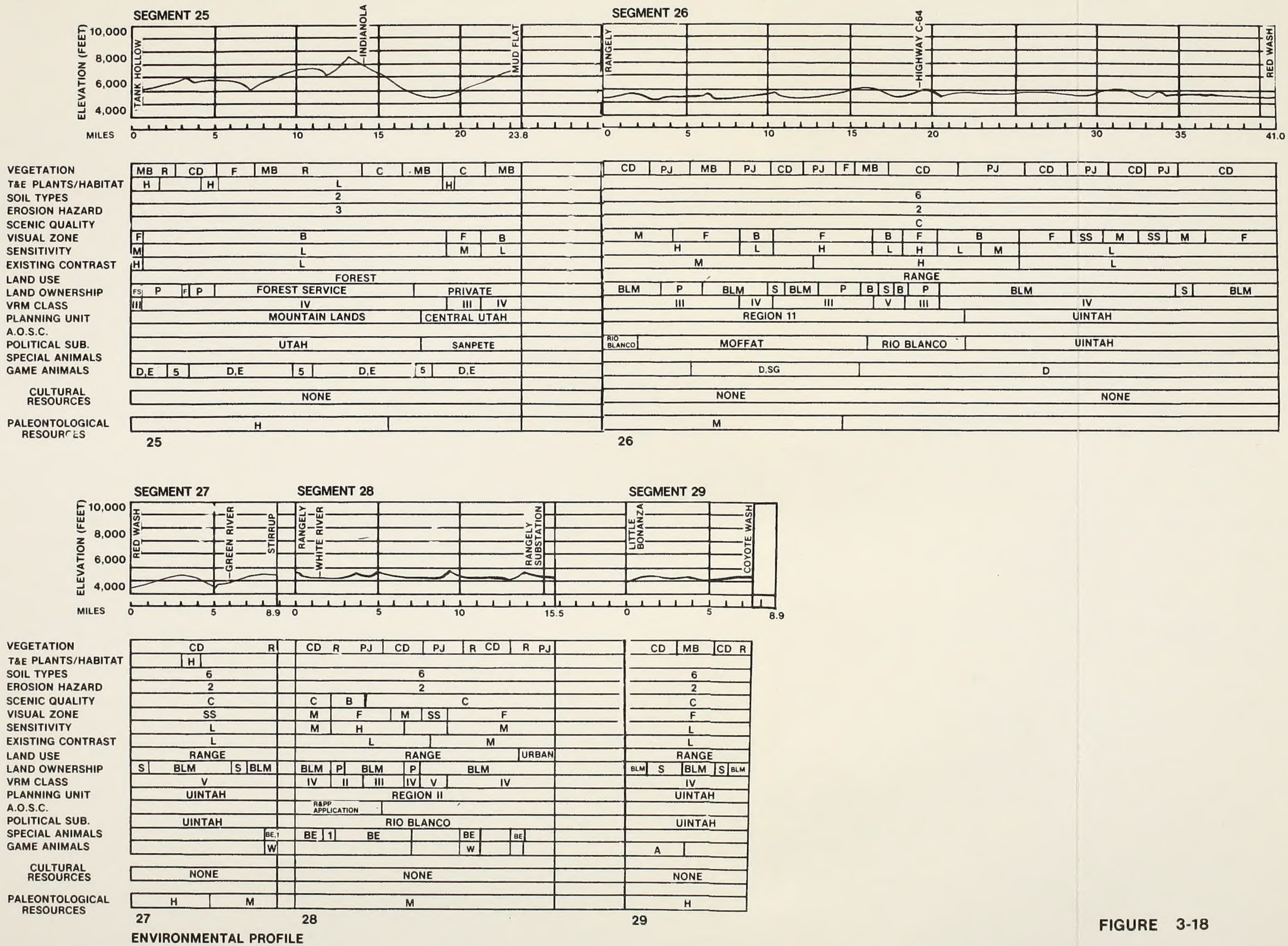
FIGURE 3-16





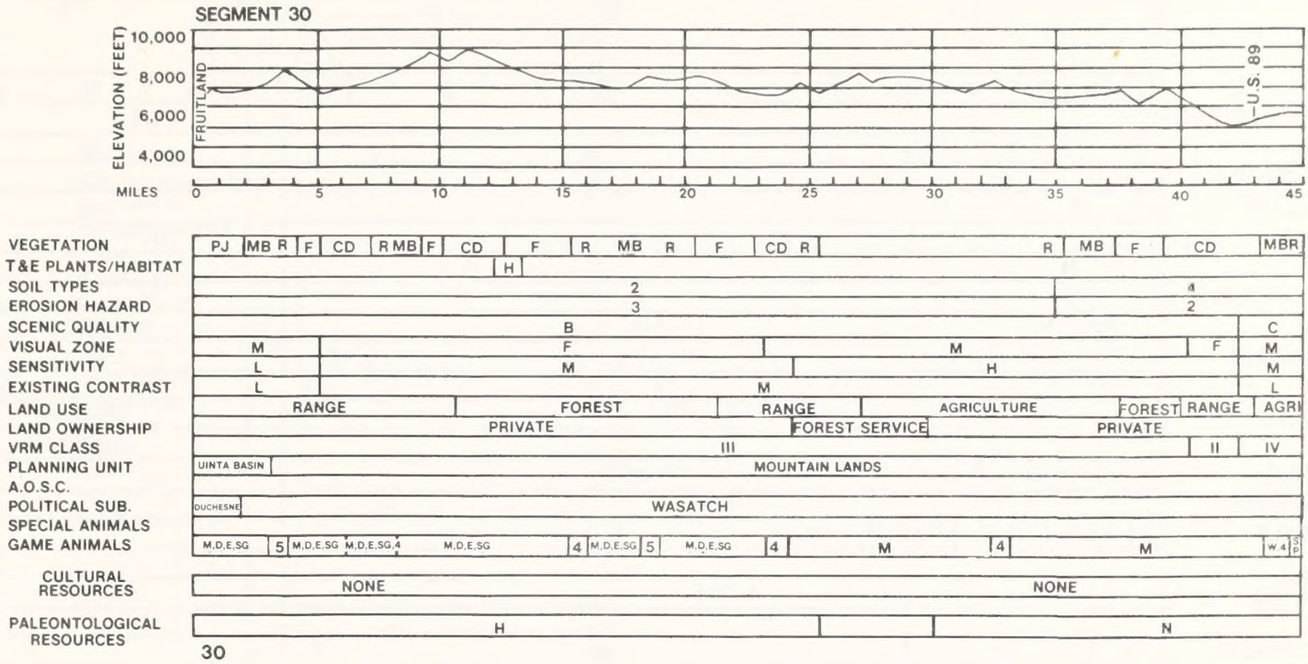
ENVIRONMENTAL PROFILE

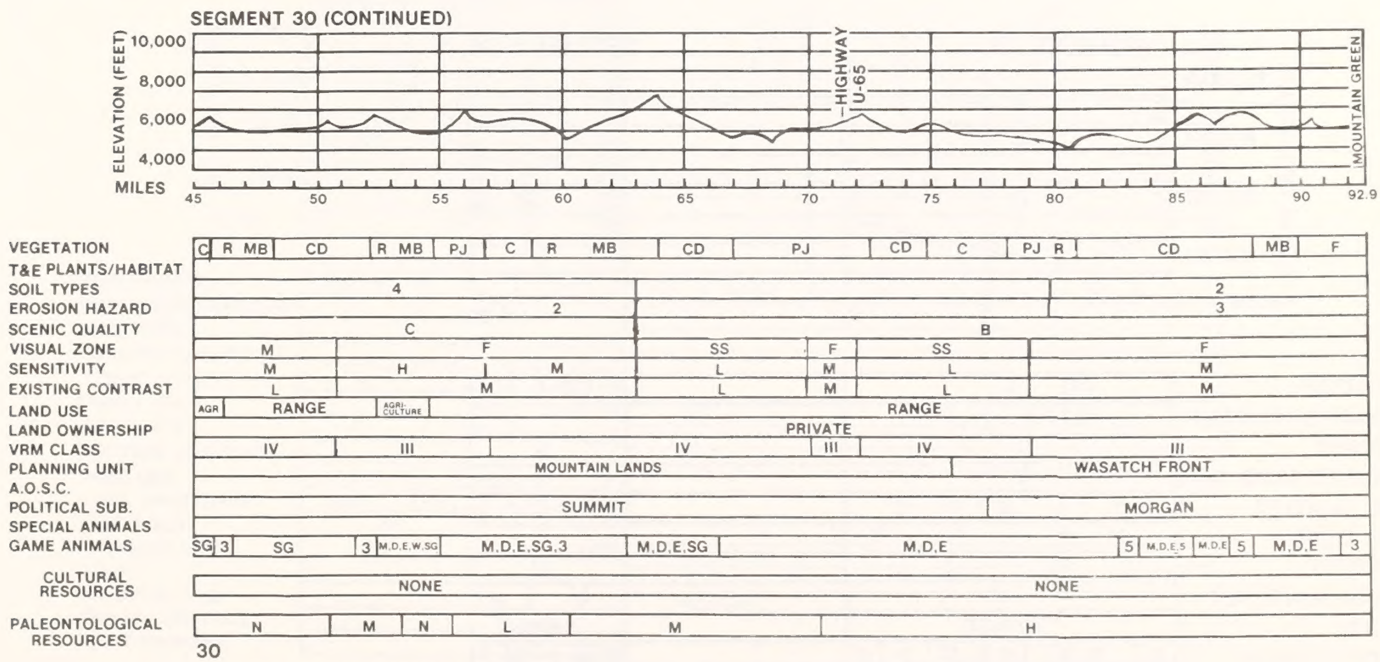
FIGURE 3-17



SEGMENT 25
SEGMENT 26
ELEVATION (FEET)
10,000
8,000
6,000
4,000
MILES
TANK HOLLOW
INDIANOLA
MUD FLAT
RANGELY
HIGHWAY C-64
RED WASH
VEGETATION
T&E PLANTS/HABITAT
SOIL TYPES
EROSION HAZARD
SCENIC QUALITY
VISUAL ZONE
SENSITIVITY
EXISTING CONTRAST
LAND USE
LAND OWNERSHIP
VRM CLASS
PLANNING UNIT
A.O.S.C.
POLITICAL SUB.
SPECIAL ANIMALS
GAME ANIMALS
CULTURAL RESOURCES
PALEONTOLOGICAL RESOURCES
FOREST
FOREST SERVICE
PRIVATE
MOUNTAIN LANDS
CENTRAL UTAH
UTAH
SANPETE
NONE
RANGE
REGION 11
UINTAH
RIO BLANCO
MOFFAT
25
26
SEGMENT 27
SEGMENT 28
SEGMENT 29
GREEN RIVER
STIRRUP
WHITE RIVER
RANGELY SUBSTATION
LITTLE BONANZA
COYOTE WASH
URBAN
REGION II
R&PP APPLICATION
27
28
29
ENVIRONMENTAL PROFILE

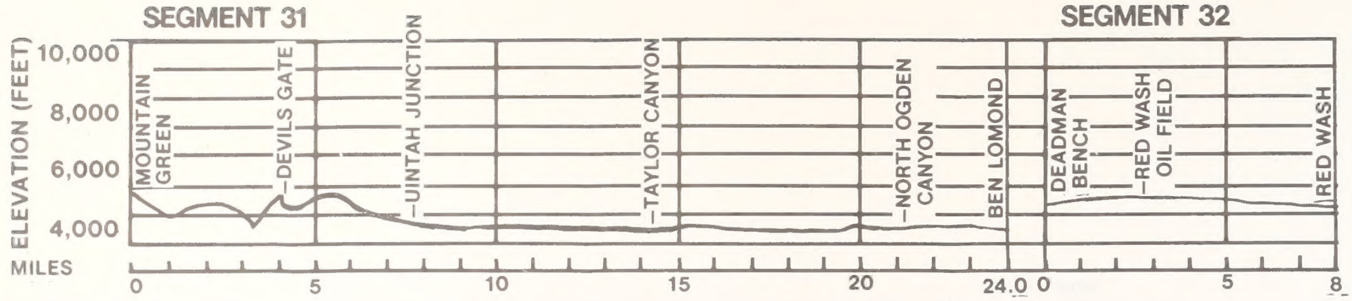
FIGURE 3-18



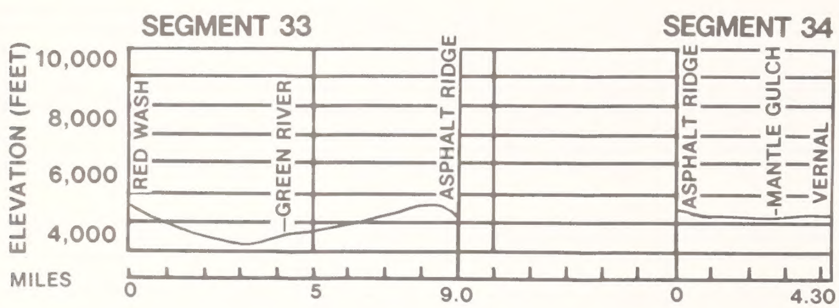


ENVIRONMENTAL PROFILE

FIGURE 3-19

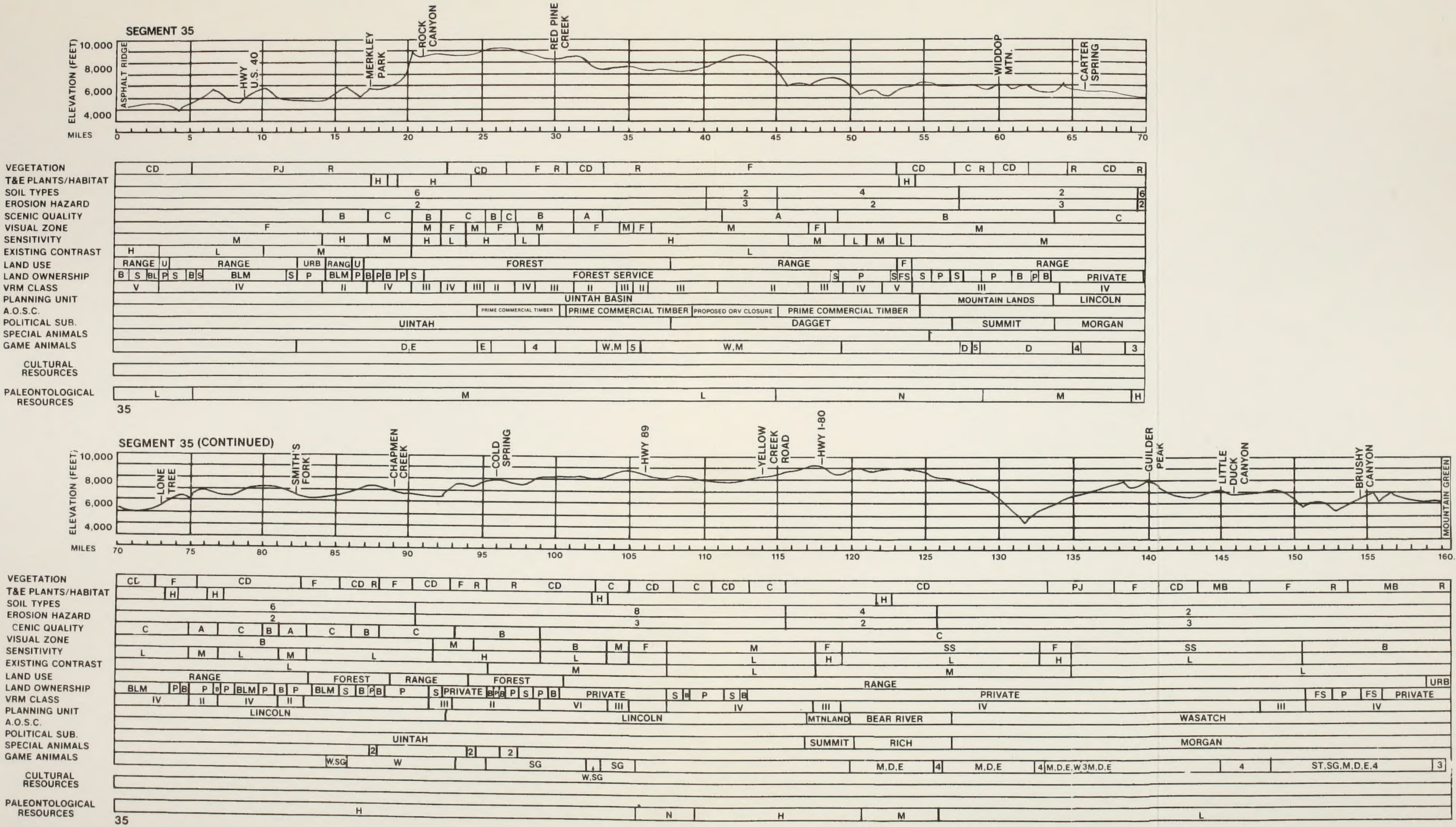


	31	32
VEGETATION	MB, R, R, R, CD, R, R, F, R, MB	CD, PJ, CD
T&E PLANTS/HABITAT		H
SOIL TYPES	2, 5, 6	6
EROSION HAZARD	3, 1, 2	2
SCENIC QUALITY	B, C	C
VISUAL ZONE	F	B, F
SENSITIVITY	H, M	L
EXISTING CONTRAST	H	H, L
LAND USE	RANGE, URBAN	RANGE
LAND OWNERSHIP	P, FS, PRIVATE	BLM
VRM CLASS	II, IV	V, IV
PLANNING UNIT	WASATCH FRONT	UINTAH
A.O.S.C.		UINTAH
POLITICAL SUB.	MORGAN, DAVIS, WEBER	
SPECIAL ANIMALS		
GAME ANIMALS	3, D,E,4, D,E, 4, D,E,3, 3, 3	
CULTURAL RESOURCES	NONE	NONE
PALEONTOLOGICAL RESOURCES	H, N, M	



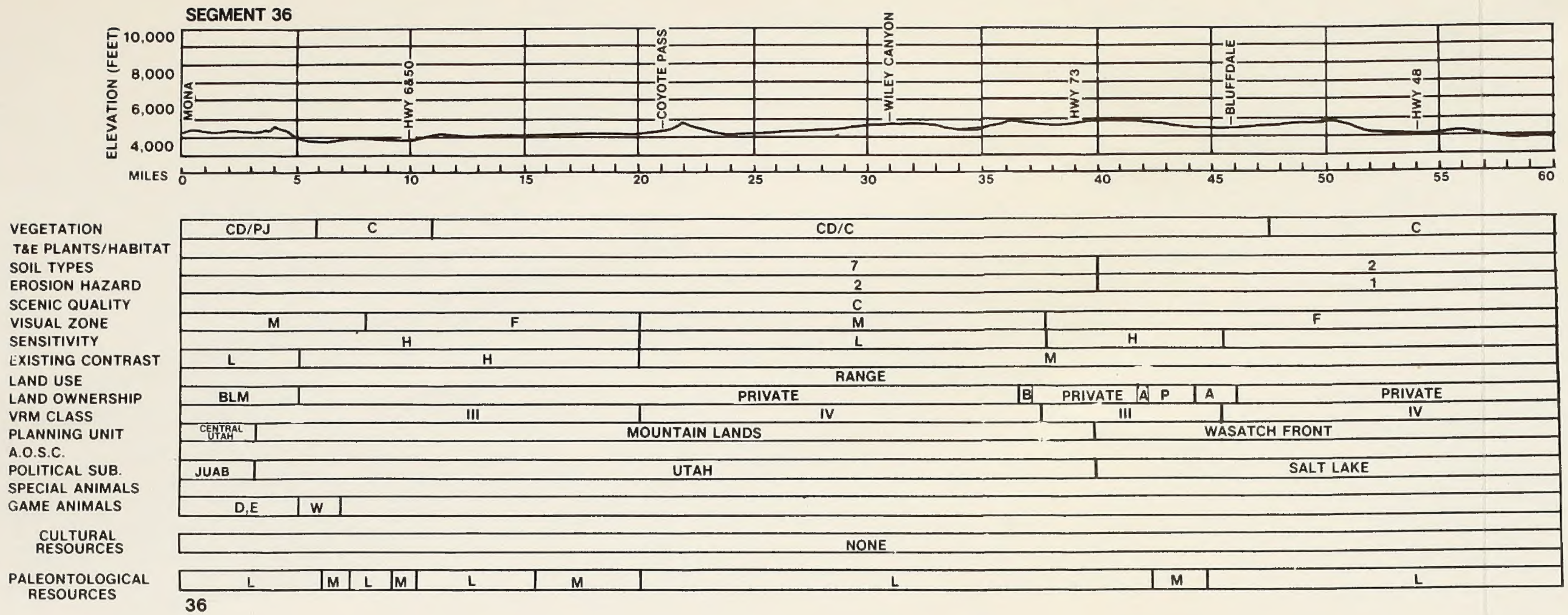
	33	34
VEGETATION	CD, R	CD, C
T&E PLANTS/HABITAT	H, H	
SOIL TYPES	6	6
EROSION HAZARD	2	2
SCENIC QUALITY	C, B, C	C
VISUAL ZONE	M, F	F
SENSITIVITY	M, L	M
EXISTING CONTRAST	M	M, H
LAND USE	RANGE	RANGE
LAND OWNERSHIP	S, BLM, P, S, P, S	B, S, P, S, P
VRM CLASS	IV, III, IV	IV
PLANNING UNIT	UINTAH	UINTAH
A.O.S.C.		
POLITICAL SUB.	UINTAH	UINTAH
SPECIAL ANIMALS	BE,1	
GAME ANIMALS	W	
CULTURAL RESOURCES		
PALEONTOLOGICAL RESOURCES	M	L

ENVIRONMENTAL PROFILE FIGURE 3-20

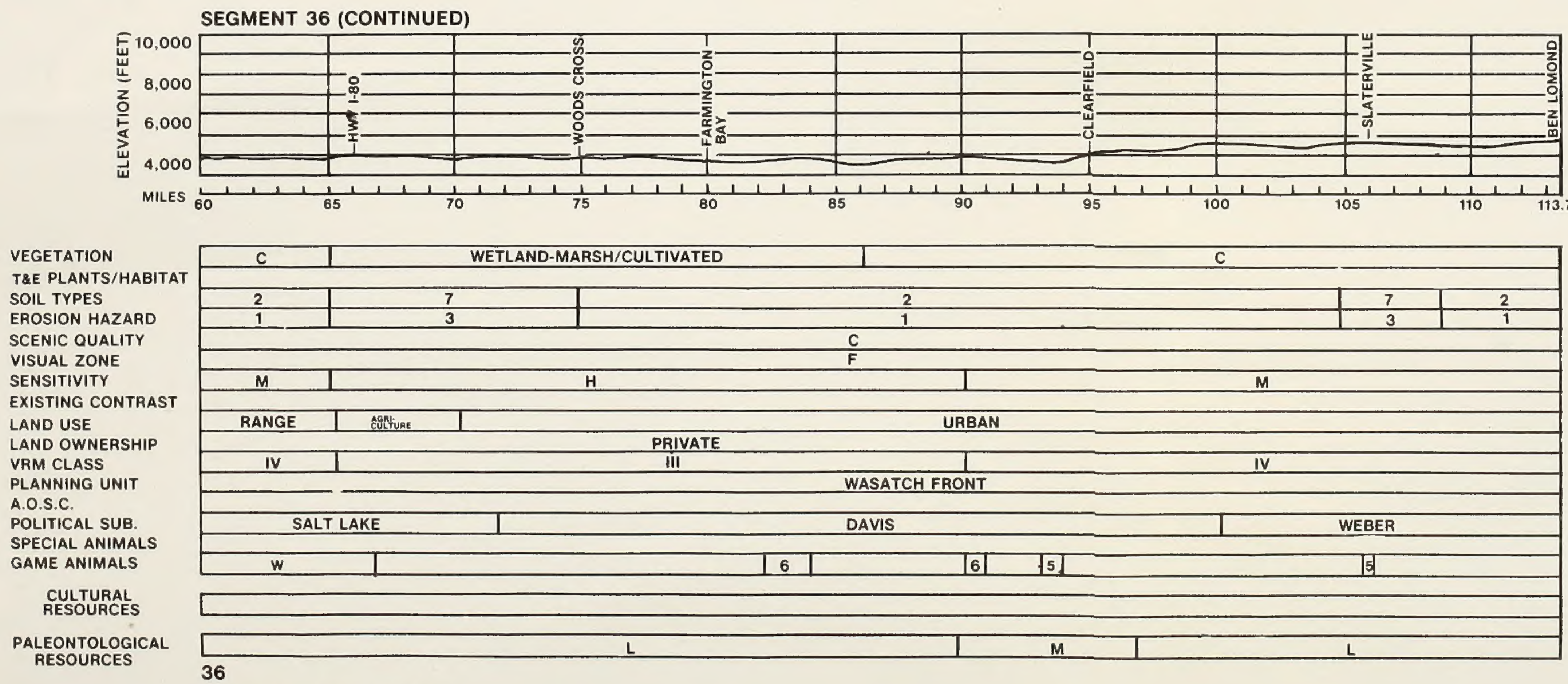


ENVIRONMENTAL PROFILE

FIGURE 3-21



36



36
ENVIRONMENTAL PROFILE

FIGURE 3-22

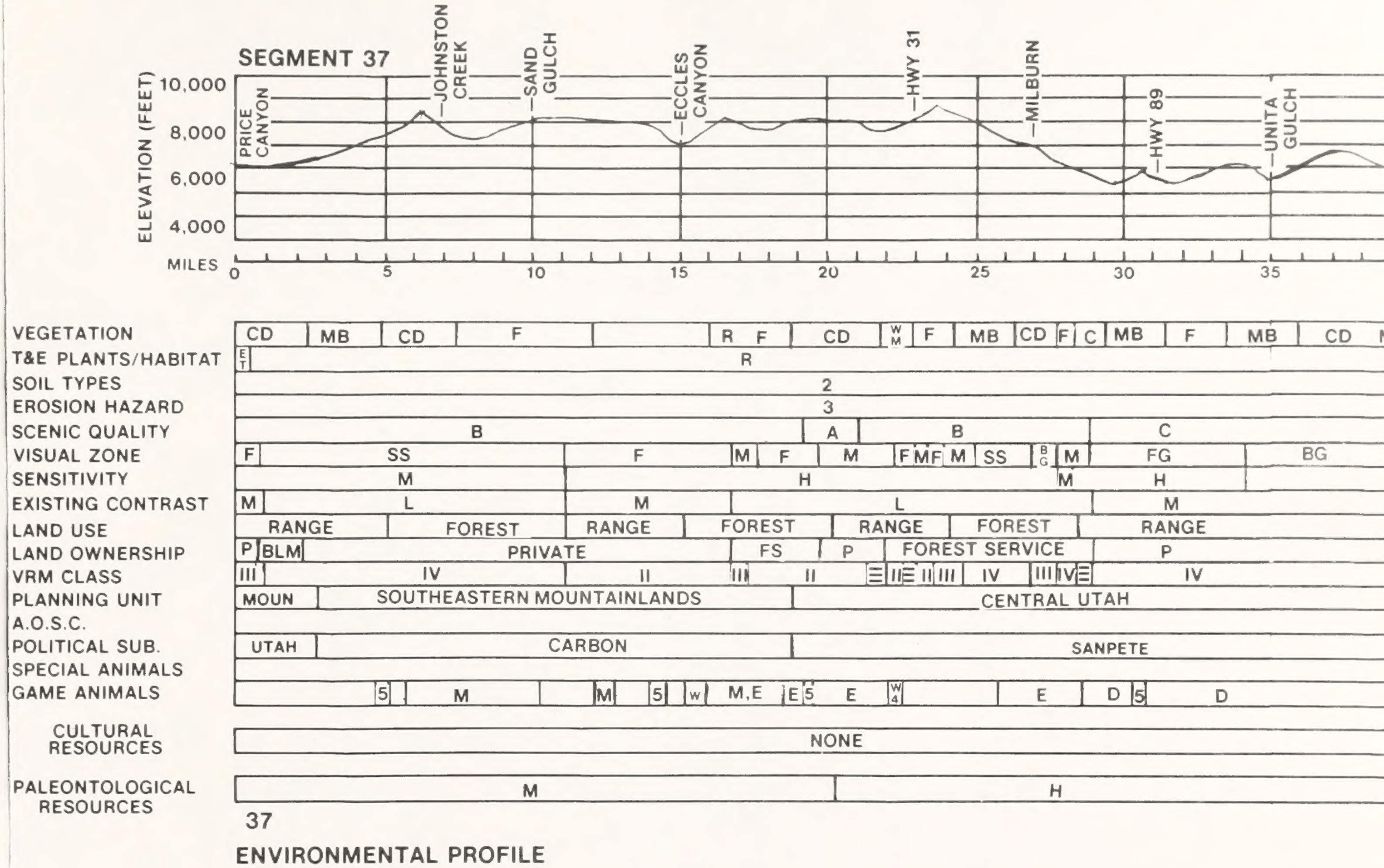

SEGMENT 37
ELEVATION (FEET)
10,000
8,000
6,000
4,000
MILES
0
5
10
15
20
25
30
35
PRICE CANYON
JOHNSTON CREEK
SAND GULCH
ECCLES CANYON
HWY 31
MILBURN
HWY 89
UNITA GULCH
VEGETATION
T&E PLANTS/HABITAT
SOIL TYPES
EROSION HAZARD
SCENIC QUALITY
VISUAL ZONE
SENSITIVITY
EXISTING CONTRAST
LAND USE
LAND OWNERSHIP
VRM CLASS
PLANNING UNIT
A.O.S.C.
POLITICAL SUB.
SPECIAL ANIMALS
GAME ANIMALS
CULTURAL RESOURCES
PALEONTOLOGICAL RESOURCES
RANGE
FOREST
PRIVATE
FOREST SERVICE
BLM
SOUTHEASTERN MOUNTAINLANDS
CENTRAL UTAH
UTAH
CARBON
SANPETE
NONE
37
ENVIRONMENTAL PROFILE

FIGURE 3-23

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes significant environmental consequences that would be expected from construction and operation of the Moon Lake power plant project alternatives.

An impact is discussed if: (1) it is considered controversial; (2) it is of high public interest or concern; (3) it substantially affects the human environment; or (4) the subject of the impact is protected by law.

To facilitate the comparison of alternatives, the direct and indirect impacts and their significance are presented in three major sections. The first section describes the environmental impacts that would be expected from construction and operation of the power plant and raw material supply system alternatives. This section also includes an analysis of the socioeconomic impacts of the project-related population. The second section describes the projected environmental impacts related to the recreational activities of the project-induced population within a secondary zone of influence. The third section describes the environmental impacts that could be expected from construction and operation of transmission system alternatives.

At the conclusion of this chapter are site specific means to mitigate the adverse environmental impacts. A summary comparative analysis table of unavoidable adverse impacts that would be expected even with application of specific mitigating measures is found at the back of Chapter 2. Included in the summary table are descriptions of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and irreversible or irretrievable commitments of resources which would be involved should the project be implemented. Energy requirements and conservation potential of the various project alternatives are presented in Appendix 20.

ENVIRONMENTAL IMPACTS OF POWER PLANT SITES AND RAW MATERIAL SUPPLY SYSTEM ALTERNATIVES

CLIMATE AND AIR QUALITY

CLIMATE

The development of ground fog within a few hundred yards of mechanical-draft cooling towers is common in certain localities (Hanna, 1978). Because of the frequent natural occurrence of fog in the Uinta Basin during the winter months, this phenomena would be expected to occur from the Moon Lake power plant in the vicinity of the cooling towers.

Burning of coal and other fossil fuels releases large quantities of carbon dioxide (CO_2) into the atmosphere. CO_2 admits short wavelength (incoming solar) radiation and absorbs longer wavelength (outgoing thermal) radiation, leading to warmer temperatures near the earth's surface and changing climates as atmospheric CO_2 levels increase.

Although the contribution from the Moon Lake power plant would be very small compared to worldwide CO_2 emissions, burning of coal at the proposed plant would minutely increase atmospheric CO_2 concentrations.

AIR QUALITY

Estimated Plant Emissions

The discharge of pollutants into the atmosphere would be an adverse impact. The estimated plant emissions of sulfur dioxide (SO_2), total suspended particulates (TSP), and nitrogen oxides (NOx) are shown in table 4-1.

Standards

Ground-level concentrations of SO_2, particulates, and NOx were estimated by mathematical dispersion modeling performed by Burns and McDonnell (1980f). The Environmental Protection Agency (EPA) Valley Model (EPA, 1977a) in the screening mode was used with hypothetical worst-case meteorological conditions assumed for 24-hour calculations. No adequate annual average emission concentrations for comparison with standards were calculated for a plant at either site because no on-site data has been collected and no existing data has been shown to be representative. However, because the 24-hour standards are generally more stringent than either the annual average or 3-hour standards, it can be assumed that if the 24-hour standards were met, the 3-hour and annual average standards would also be met.

New Source Performance Standards (NSPS)

Table 4-2 presents the State and Federal NSPS and the expected emissions from the proposed Moon Lake power plant at either the Bonanza or Rangely sites. Plant emissions would be less than the allowable limits for SO_2 and equal the limits for NOx and particulates.

Prevention of Significant Deterioration (PSD) and Colorado Category I Increments

Maximum calculated increased ground-level concentrations of SO_2 and particulates at Dinosaur National Monument (Dinosaur) Headquarters are given in table 4-3.

In order to meet the Colorado Category I increments at Dinosaur, modeling results show that 93.6-percent SO_2 control would be needed from a plant at the Bonanza site and 94.9-percent SO_2 control would be needed from a plant at the Rangely site. Slightly higher SO_2 control was determined to be needed at the Rangely site because it is closer to Dinosaur than the Bonanza site.

It should be pointed out that while the model used does present an intensity of impact estimate, it does not include an analysis of impact occurrence frequency. The model simply assumes stable, light wind speed conditions with a wind direction that would transport the plume directly toward the area of interest for 6 hours in a 24-hour period. Figure 3-1 is a plume level wind rose constructed from pibal data collected from October 1976 to January 1978 at the Ua-Ub oil shale tracts 5 miles south of Bonanza. Southwest winds, which would be necessary to transport the plume from a Bonanza plant to the Dinosaur Headquarters occurred about 8 percent of the time. East-southeast winds, which would transport the plume from a plant at the Rangely site to the Dinosaur Headquarters occurred only about 2 percent of the time.

Table 4-3 shows that if Dinosaur were reclassified to PSD Class I, then Class I particulate increments would not be violated by a plant at either site. Maximum estimated increased particulate and SO_2 concentrations in Class

TABLE 4-1

Estimated Plant Emissions

	Estimated Emission Rate[a] (tons/day)	
	Bonanza Site	Rangely Site
Sulfur Dioxide	5.1	4.0
Particulates	2.9	2.9
Nitrogen oxides	58.4	58.4

[a]Assumes heat input to boiler of 4,055 X 10^6 Btu/hr. at 100-percent load, average sulfur content of 0.45-percent sulfur, SO_2 emission rates based on the amount of emission control necessary to meet Colorado Category I Increments at Dinosaur National Monument, and average heat content of 10,500 Btu/lb. NOx and particulate emission estimates are rates allowed by the New Source Performance Standards (NSPS).

TABLE 4-2

Comparison of Predicted Emissions and Applicable New Source Performance Standards

	Particulates	Sulfur Dioxide	Nitrogen Oxides
Proposed Generating Station Control Equipment[a]	Fabric-Filter Baghouse	Wet-Limestone Scrubber	Boiler Design and Operation
Emission Rate (lb/MBtu)	0.03	0.052 Bonanza Site[b] 0.041 Rangely Site[b]	0.60[c]
NSPS[d] Emission Rate (lb/MBtu)	0.03	0.60	0.60[c]

Source: Burns & McDonnell, 1980f.

[a]Control equipment designed to be Best Available Control Technology (BACT) as required by Prevention of Significant Deterioration (PSD) regulations (40 CFR 52.21).

[b]Assuming average grade coal with 0.45-percent sulfur content, heating value of 10,500 Btu/lb, and SO_2 control needed to meet Colorado Category I increments.

[c]Emission rate based on bituminous coal.

[d]40 CFR 60.

TABLE 4-3

Comparison of Maximum Calculated Increased Ground-Level Concentrations of SO_2 and Particulates to Allowable Increments at Dinosaur National Monument Headquarters

Pollutant	Bonanza Site ($\mu g/m^3$)	Rangely Site ($\mu g/m^3$)	Colorado Category I Increments ($\mu g/m^3$)	PSD Class I Increments[a] ($\mu g/m^3$)
Sulfur Dioxide[b]				
3 hour	c	c	25.0	25.0
24 hour[d]	5.0	5.0	5.0	5.0
Annual	e	e	2.0	2.0
Particulates				
24 hour[d]	2.9	3.6	f	10.0
Annual	e	e	f	5.0

Source: Burns and McDonnell, 1980f.

[a]Dinosaur National Monument is presently a PSD Class II area.

[b]SO_2 emission rates of 53.2 grams per second (g/s) at Bonanza and 42.4 g/s at Rangely necessary to meet Colorado Category I increment were assumed; the percentage SO_2 control required is 93.6 percent at Bonanza and 94.9 percent at Rangely.

[c]The Valley model in the screening mode does not estimate 3-hour concentrations. If the 24-hour increment is met, it is assumed that the 3-hour increment is also met, because the 3-hour increment is generally less restrictive.

[d]Concentrations were calculated by using the EPA screening process which utilizes the EPA Valley Model, F stability, a wind speed of 5.5 mph, winds blowing directly toward the headquarters, and average grade coal.

[e]Representative meteorological data not available.

[f]Colorado does not have Category I increments for particulates.

II areas are compared with PSD Class II incremental limitations in table 4-4, which shows that no Class II increments would be violated from a plant at either site.

Because very high SO_2 control was shown to be needed using the screening procedure, BLM requested EPA to do a feasibility study on obtaining the approximately 95-percent SO_2 control needed from a plant at either site. After reviewing materials submitted by Deseret, EPA stated,

> "Sustained performance at 95 percent control efficiency is not well documented at present. This lack of documentation is explained primarily by the general absence of State or Federal performance standards requiring that degree of control, and by the lack of continuous emission monitoring data from existing plants with sulfur dioxide controls. While sustained 95-percent control has not been well-documented and appears to be at the upper limit of existing control technology, we have no reason to conclude that it cannot be achieved." (EPA, 1980).

The State of Utah Air Quality Bureau also reviewed the material submitted by Deseret Generation and Transmission Cooperative (Deseret) and concluded,

> "...There is sufficient evidence that certain control configurations utilizing specific reagents result in 95+ percent removal if operated and maintained properly. However, without further detailed plans and specifications for the control equipment and additional removal techniques for the Moon Lake project, it is impossible to ascertain the actual SO_2 removal capacity that could be expected." (Utah Bureau of Air Quality, 1980).

These studies were preliminary reviews and before a PSD permit is issued, the final review will be done by the State of Utah and EPA if the plant is located in Utah or by the State of Colorado and EPA if located in Colorado.

Deseret has applied to EPA for a PSD permit for two 400-MW units at the Bonanza site. If the plant were to be built at the Rangely site, Deseret would submit another PSD permit application for the Rangely site.

A public notice was published in November 1980 (Vernal Express, Vernal, Utah and Grand Junction Sentinel, Grand Junction, Colorado) of EPA's proposed PSD permit issuance for the Moon Lake power plant at the Bonanza site. Final action by EPA on a PSD permit for a plant at the Bonanza site could occur in January 1981. As of December 19, 1980, the Utah Bureau of Air Quality was still reviewing information submitted by Deseret. If the information is adequate, then the State of Utah could propose to issue an Air Quality Approval Order in January 1981 with final action about February 1981.

National Ambient Air Quality Standards (NAAQS)

The NAAQS, less stringent than PSD limitations, represent the upper limit on allowable ground-level pollutant concentrations. A comparison of the predicted maximum ground-level concentration produced by a generating station at the Bonanza and Rangely sites (including background concentrations) and the NAAQS is presented in table 4-4. The background levels were measured near Vernal, Utah by the Utah Bureau of Air Quality during 1978.

TABLE 4-4

Maximum Calculated Ground-Level Concentrations, Class II Incremental Limitations, and National Ambient Air Quality Standards[a] ($\mu g/m^3$)

	Bonanza Site	Rangely Site
Present Background Levels[b]		
Sulfur Dioxide		
3-hour	27.0	27.0
24-hour	27.0	27.0
Annual	0.0	0.0
Particulates		
24-hour	99.0	99.0
Annual	31.0	31.0
Nitrogen Dioxide		
Annual	16.9	16.9
Predicted Plant Increment Increase[c]		
Sulfur Dioxide		
3-hour	d	d
24-hour	28.7	22.7
Annual	e	e
Particulates		
24-hour	16.4	16.4
Annual	e	e
Nitrogen Dioxide		
Annual	e	e
Allowable Class II Increment		
Sulfur Dioxide		
3-hour	512.0	512.0
24-hour	91.0	91.0
Annual	20.0	20.0
Particulates		
24-hour	37.0	37.0
Annual	19.0	19.0
Nitrogen Dioxide		
Annual	None	None

(continued)

TABLE 4-4 (concluded)

	Bonanza Site	Rangely Site
<u>Predicted Total Concentration</u>		
Sulfur Dioxide		
3-hour	d	d
24-hour	55.5	49.7
Annual	e	e
Particulates		
24-hour	115.4	115.4
Annual	e	e
Nitrogen Dioxide		
Annual	e	e
<u>NAAQS</u>		
Sulfur Dioxide		
3-hour	1,300.0	1,300.0
24-hour	365.0	365.0
Annual	80.0	80.0
Particulates		
24-hour	150.0	150.0
Annual	60.0	e
Nitrogen Dioxide		
Annual	100.0	100.0

Source: Burns & McDonnell, 1980a and Utah Bureau of Air Quality, 1979.

[a]All concentrations represent average in micrograms per cubic meter over the time period specified.

[b]Background concentrations measured at Naples, Utah by Utah Bureau of Air Quality.

[c]Concentrations predicted to occur at point closest to plant where stack emissions plume impacts elevated terrain. Distances from the Bonanza and Rangely sites both are 9 kilometers. SO_2 emission rates controlled to meet Class I increments at Dinosaur.

[d]The Valley model in the screening mode does not estimate 3-hour concentrations.

[e]Representative meteorological data not available to determine annual concentrations.

The total ground-level concentrations from the proposed plant and background levels would meet all NAAQS.

Acid Precipitation and Dry Deposition

The formation of acid in the atmosphere is not well understood at this time, although it does occur. Research into this phenomena is currently ongoing. The proposed Moon Lake power plant would introduce acids into the environment by emitting SOx, NOx, and CO_2 which can react with atmospheric water to form sulfuric acid (H_2SO_4), nitric acid (HNO_3), and carbonic acid (H_2CO_3) In addition, hydrochloric acid (HCl) may be directly emitted (EPA, 1979a). Observed and potential environmental effects of acid precipitation and dry deposition are discussed in Appendix 21.

Acid production resulting from the proposed Moon Lake power plant would be small, but would be part of a cumulative effect which could become significant when combined with increased emissions from future energy development, industrial activity, and population growth in the Western United States.

Trace Elements

The Moon Lake power plant would emit a variety of trace elements into the atmosphere during power plant operation.

Long-term accumulation of trace elements would have a potential negative impact on the environment if accumulated in sufficient quantities, but distribution pathways through the ecosystem are not well understood. No modeling to project trace element emissions has been done for this project. However, the proposed plant would make a relatively small contribution to existing levels during its operating life (Burns and McDonnell, 1979b).

The PSD regulations (Federal Register, August 7, 1980) require PSD review, including BACT determination, and air quality analysis for all pollutants to which the National Emission Standards for Hazardous Air Pollutants (NESHAPS) apply, as well as for NAAQS criteria pollutants, unless emission rates would be below minimum levels set by EPA. The Moon Lake power plant would be subject to review for beryllium, lead, florides, and possibly mercury and asbestos. Preconstruction monitoring of all pollutants subject to review would be required unless the applicant demonstrates that either existing concentrations in the impact area or its projected impact is less than the minimum concentrations set by EPA.

Visibility

The Secretary of the Interior has, in accordance with Section 164(d) of the Clean Air Act, identified Dinosaur as an area where air quality related values (including visibility) are important attributes of the area (June 25, 1980 Federal Register) and the National Park Service (NPS) has recommended to Congress that the Monument be redesignated to PSD Class I.

Areas designated as Colorado Category I (including Dinosaur) are not presently afforded visibility protection under Colorado law. If all or part of Dinosaur were redesignated as Federal Class I by the State of Colorado and/or Utah it would be given visibility protection under Section 165(d) of the Clean Air Act. Until such time as redesignation occurs, no restraints apply to either plant site. However, the State of Utah has indicated that they would not consider Dinosaur for redesignation to PSD Class I. Section 165(e)(3)(b) of the Clean Air Act, regarding PSD permits, requires a visibil-

ity analysis to be performed as a preconstruction requirement. Systems Application, Incorporated (SAI), conducted a visibility assessment for the Bonanza site. Burns and McDonnell used the SAI model to assess visibility impacts for the Rangely site.

After consultation with NPS staff, the Dinosaur Visitor Center 7 miles north of Jensen, Utah and the Dinosaur Headquarters Scenic Drive Overlook, 7 miles north of the Town of Dinosaur, Colorado were chosen as the viewing points because of the concentration of visitors at these locations.

Results of Visibility Modeling

A summary of the modeling results is given here. A more detailed and technical discussion on model assumptions and predicted impacts appears in Appendix 22.

Bonanza Site

Under adverse meteorological conditions, a highly visible yellow-brown plume from nitrogen oxide emissions would be observed from the Dinosaur Visitor Center. Reduction in visual range would generally be less than 5 percent. Impacts at the scenic drive overlook would be less severe with visual range reduction for most views of less than 2 percent and a yellow-brown plume would be faintly visible.

Rangely Site

A highly visible yellow-brown plume would be seen by observers at the visitors center during adverse meteorological conditions. Visual range reduction would generally be less than 5 percent. Impacts at the scenic drive overlook would be somewhat less severe with a moderately discolored yellow-brown plume visible and visual range reduction for most viewing angles of less than 5 percent.

Frequency of Visibility Impact

The predicted intensity of impacts at the visitor center would be about equal for Rangely and Bonanza, while impacts at the scenic drive overlook would be somewhat more intense with a Rangely plant than with a Bonanza plant.

The conditions modeled for the Bonanza and Rangely plants were assumed to represent worst-case conditions for impacts at the visitor center and scenic drive overlook. Other conditions, not modeled, with different stability, wind speeds, or wind directions, may also result in perceptible discoloration with a frequency of occurrence that cannot be determined with the analyses available.

The EPA, recognizing that Dinosaur is presently a Federal Class II area, considers the visibility requirements of the PSD regulation to have been met (EPA, 1980b).

Frequency of Visibility Impacts at the Bonanza Plant Site

The specific set of meteorological conditions modeled (E stability windspeed of 2.5 m/s and south winds) (see Appendix 13 for definition of terms) which identified the greatest impairment to visibility (a strongly discolored yellow-brown plume) at the Dinosaur Visitor Center occurred during 5 mornings

out of 198 mornings for which data was available. If the frequency of occurrence of conditions encountered during the soundings are representative of yearly frequencies, then this condition would be expected to occur about 9 mornings per year. The set of conditions did not occur during any afternoons for which data was available.

Another set of specific conditions modeled (E stability, windspeed of 2.5 m/s and south-southeast winds) which indicated perceptible but less severe discoloration viewed from the visitor center occurred during 12 out of 198 morning soundings.

The condition modeled which identified impairment at the scenic drive overlook occurred during 1 morning out of 198 soundings.

Frequency of Visibility Impacts at the Rangely Plant Site

The specific set of meteorological conditions modeled which indicated visibility impairment at the visitor center and scenic drive overlook occurred once during 198 morning soundings. The low frequency of occurrence is a result of the rarity of east-southeast winds needed to transport the plume from a Rangely plant past the visitor center and scenic drive overlook.

Cumulative Air Quality Effects of the Moon Lake Power Plant and Oil Shale Development

An issue identified in the scoping process was the question of whether the operation of the proposed Moon Lake power plant could hinder oil shale development by consuming air quality increments needed for development of oil shale. As previously mentioned, modeling results showed that the Moon Lake power plant would be expected to increase the maximum 24-hour average SO_2 concentration at the Dinosaur Headquarters by an amount equal to or less than the Colorado Category I incremental limitation of 5.0 $\mu g/m^3$. Increased annual average SO_2 concentrations at Dinosaur Headquarters would be an unknown amount but expected to be less that the Category I limitation of 2.0 $\mu g/m^3$.

The White River Shale project (WRSP) proposes oil shale development at the Ua-Ub tracts about 22 miles south-southwest of Dinosaur Headquarters and would result in emissions of SO_2. Because the wind directions required to transport plumes from the Bonanza site and the WRSP to Dinosaur Headquarters (southwest and south-southwest, respectively) vary by only one 22.5 degree sector, impaction of both plumes at Dinosaur Headquarters may occur during some 24-hour periods. However, lacking adequate meteorological data and with the uncertainties involved with emission rates, locations, and stack parameters associated with the WRSP, it cannot be determined whether the combination of the Moon Lake power plant and the WRSP (or any other potential SO_2 sources) would result in violations of the Colorado Category I 24-hour average standard for SO_2 at Dinosaur Headquarters.

Because wind directions needed to transport the plume from a plant at Rangely to Dinosaur Headquarters (east-southeast winds) are considerably different than directions required to transport plumes from the WRSP to Dinosaur Headquarters, and winds infrequently blow from the Rangely site toward the headquarters, possible cumulative impacts on a 24-hour or annual basis between the Moon Lake project and the WRSP are less likely to occur from a Rangely plant than for a Bonanza plant.

With the lack of representative meteorological data and the uncertainties involved with emissions data and extent of development of oil shale and other SO_2 sources, it is not now possible to determine what portion of the annual

increment at Dinosaur would be consumed by the Moon Lake project, oil shale, or any other SO_2 emission source.

In conclusion, while it is possible that SO_2 emissions from the Moon Lake power plant could interact with SO_2 emissions from oil shale development and other potential SO_2 sources, it is not possible to predict to what extent oil shale or other development might be hindered because of this issue. Colorado has not included particulate standards in the Colorado Category I limitations. Therefore, only PSD Class II limitations for particulate matter apply to Dinosaur. Recognizing that SO_2 levels from the Moon Lake power plant would approach Colorado Category I standards, while particulate increases from the Moon Lake project would be less than one-half of the PSD Class II limitations, it is expected that particulate increases from the Moon Lake project would not hinder oil shale development.

TOPOGRAPHY

Subsidence and related earth fractures may occur above underground mines as a result of the removal of one or more coal beds (USDI, BLM, 1978).

Table 4-5 lists the area that would be mined by longwall and room and pillar mining techniques at the Deserado Mine.

Longwall mining would produce the most subsidence with a more immediate occurrence. This is because the roof over the mined area is allowed to cave in as mining progresses. This method would be used in both B/C and D seams and would affect a total surface area of about 4,100 acres (figures 2-16 and 2-17). Maximum subsidence from this method would be approximately 6 feet (Abel, 1980). Initial subsidence with the room and pillar method would be minimal (1.6 feet or less). This method would be used in both seams D and B/C and would affect 1,026 surface acres. Some tension cracks would probably reach the surface; however, changes would be subtle and unnoticeable to the casual observer. There are no perennial streams or springs that could be affected by tension cracks.

GEOLOGY AND PALEONTOLOGY

Table 4-6 shows the acreage of paleontologically important geologic formations that could be disturbed by the project. Under each alternative, some important and useful fossils could be lost to the scientific community. Fossils are important in the interpretation of earth history and the evolution of living organisms. The potential loss is unquantifiable, but would be greatest in those formations having high and moderate probabilities of important fossil occurrence.

SOILS

The acreages which would be disturbed and occupied by the various project alternatives are listed in table 2-1. Localized erosion would occur on disturbed areas. Due to the localized nature of soil disturbance, no secondary impacts to off-site soils, water quality, or other resources are expected.

WATER RESOURCES

SURFACE WATER

The potential reductions in flow of the Green and White Rivers and the percent of the yield of the Utah White River, Taylor Draw, and Wolf Creek

TABLE 4-5

Mining Techniques by Seam[a]

Year	Method	Acres
Coal Seam D		
1984-1989	Longwall	345
	Room and Pillar	1,110
1990-1996	Longwall	720
	Room and Pillar	950
Coal Seam B and B/C		
1993-1995	Room and Pillar	291
1997-2001	Longwall	1,030
	Room and Pillar	60
2002-2006	Longwall	510
2007-2011	Longwall	588
2012-2016	Longwall	895

[a]With vertical overlap of the D and B/C seams, 4,106 surface acres would be undermined by the longwall method and 1,026 by the room-and-pillar method for a total subsidence area of 5,132 acres.

TABLE 4-6

Potential Disturbance of Exposed Geological Formations With Moderate to High Probability of Important Fossil Occurrence

	Bonanza Site (acres)	Rangely Site (acres)
Plant Site	0	1,050
Coal Supply		
Deserado Mine Portal Area	100	100
Refuse Disposal Area	609	609
Coal Transportation Alternatives		
Electric Railroad		
Railroad Mainline	442	N/A
Coal Storage and Loadout Area	280	N/A
Coal Delivery Conveyor	36	N/A
Overland Conveyor	339	36
Slurry Pipeline	339	N/A
Off-Highway Truck Haul	29	58
Water Source and Transport Alternatives		
Green River Collector Well System and Pipeline	43	315
Utah White River Reservoir Pipeline	0	N/A
Taylor Draw Reservoir	N/A	0
Taylor Draw Pipeline	N/A	43
Wolf Creek Reservoir	N/A	0
Wolf Creek Reservoir Pipeline	N/A	26
Total	738-1,510	1,821-2,132

Note: N/A indicates not applicable.

Reservoirs that would be utilized by the Moon Lake project are shown in table 4-7.

Green River

It would be technically possible for Deseret to utilize Green River water (from its existing 30 cfs water right or from Flaming Gorge storage) to supply the power plant whether the plant site is located at Bonanza or Rangely. It is uncertain, however, if legal and state water policy would allow transfer of water from Utah to Colorado for this project. This was noted in the discussion of unresolved issues in the Summary (also see Appendix 2). This right represents 0.69 percent of the average annual flow and 2.06 percent of the lowest annual flow recorded. It constitutes 1.66 percent of Utah's total consumptive water allotment under the Colorado River Compact. Withdrawal of the 30 cfs would be the worst case situation, since it is projected that unit 1 at 80-percent capacity would consume 7,075 acre-feet per year (10 cfs). Operating at 20-percent capacity, units 1 and 2 would use 14,150 acre-feet per year (19.5 cfs), but the maximum withdrawal for the power plant would be 17,470 (24 cfs) acre-feet per year.

The amount of water required for future energy development (by the year 2000) in the upper Colorado has been estimated by the Water and Power Resources Service (1979) and Colorado Department of Natural Resources (1979) to be as follows: Cheyenne Unit, 24,000 acre-feet; Central Utah Project (CUP), 278,700 acre-feet; deferred Indian lands, 51,000 acre-feet; Hayden-Craig project, 20,000 acre-feet; oil shale development, Green River and tributaries, 220,890 acre-feet; TOSCO, 18,000 acre-feet; and Yellow Jacket Water Conservancy District (YJWCD), 126,400 acre-feet. These figures are speculative and are by no means a complete list of all water depletions that are in the planning stage, but they do illustrate the demand that could be placed on the Green River and tributaries by the end of the century.

Without the Moon Lake project, the cumulative withdrawal on the Green River system could be 738,900 acre-feet depending on the number of projects actually developed. This would be 70 percent of the lowest flows and 23 percent of the average annual flow in the Green River at Green River, Utah.

Cumulatively with the Moon Lake project implemented, the river's lowest recorded flow would be reduced by 72 percent and average flow reduced by 24 percent.

Deseret could purchase up to the 30 cfs to be released from Flaming Gorge Reservoir to the Green River as a source of water for the project. Increased flows would have very little effect on overall water quality, velocity, or temperature under the present situation and would vary depending upon the amounts released from Flaming Gorge Dam. Presently about 800 cfs are being released. The Water and Power Resources Service is required to release at least 400 cfs. Until releases drop to the 400 cfs level, the 30 cfs owned by Deseret would not be released as make up water and would make no difference in the flow regime.

It is projected that the water withdrawal would increase total dissolved solids (TDS) in the river by about 0.8 mg/ℓ at Green River, Utah (Hansen, 1980a) and about 1 mg/ℓ at Imperial Dam, California (Hansen, 1980b). The annual direct and indirect damage to agriculture, municipal, and industrial water users could be between $325,000 and $430,000 per mg/ℓ increase in salinity at Imperial Dam, (USDI, 1979). Table 4-8 shows the projected future increases in salinity in the Green River that would result from development of the CUP and other water projects on the Green River and its tributaries.

TABLE 4-7

Potential Percent Reductions in Flow and Water Yields[a]

	Bonanza Plant Site: Deseret Green River Water Rights 21,720 ac ft/yr	Bonanza Plant Site: Identified Need at Power Plant 17,470 ac ft/yr	Rangely Plant Site: Deseret Green River Water Rights 21,720 ac ft/yr	Rangely Plant Site: Identified Need at Power Plant 17,470 ac ft/yr	Either Rangely or Bonanza Site Coal Mine Withdrawal 304.8 ac ft/yr	Bonanza Site Slurry Pipeline Withdrawal 1,375 ac ft/yr	Increased Municipal Water Use With the Rangely Site 1.42 ac ft/yr	Total Deseret White River Water Right 4,344 ac. ft/yr
Green River								
Percent of Average Annual Flow[b]	0.69	0.55	0.69	0.55	N/A	N/A	N/A	N/A
Percent of Lowest Recorded Annual Flow[c]	2.06	1.66	2.06	1.66	N/A	N/A	N/A	N/A
White River								
Percent of Average Annual Flow[d]	N/A	N/A	N/A	N/A	0.06	0.27	0.0003	0.86
Percent of Lowest Recorded Annual Flow[e]	N/A	N/A	N/A	N/A	0.14	0.62	0.0006	1.95
Utah White River Reservoir								
Percent of Capacity[f]	N/A	16.64	N/A	N/A	N/A	1.31	N/A	N/A
Percent of Estimated Annual Yield[g]	N/A	6.99	N/A	N/A	N/A	0.55	N/A	N/A
Taylor Draw Reservoir								
Percent of Capacity[h]	N/A	N/A	N/A	126.59	N/A	9.96	N/A	N/A
Percent of Estimated Annual Yield[i]	N/A	N/A	N/A	42.13	N/A	3.32	N/A	N/A
Wolf Creek Reservoir								
Percent of Capacity[j]	N/A	N/A	N/A	29.12	N/A	2.29	N/A	N/A
Percent of Estimated Annual Yield[k]	N/A	N/A	N/A	27.56	N/A	2.17	N/A	N/A

[a]N/A indicates that the water for these project components would not likely be obtained from the indicated source.

[b]3,157,000 acre-feet equals average annual flow of the Green River. Example calculation $\frac{21,720}{3,157,000}$ = 0.69 percent.

[c]1,055,000 acre-feet lowest recorded flow.

[d]502,800 acre-feet.

[e]223,200 acre-feet lowest recorded flow.

[f]105,000 acre-feet.

[g]250,000 acre-feet.

[h]13,800 acre-feet.

[i]41,462 acre-feet.

[j]60,000 acre-feet.

[k]63,382 acre-feet.

Because of the large volume of flow in the Green River, no detectable change in temperature and pH would occur due to Moon Lake project water withdrawal.

TABLE 4-8

Projected Salinity Conditions of the Green River (TDS)

	Projected 1990 Level		Projected 2000 Level	
	Without Project	With Project	Without Project	With Project
Green River at Green River, Utah	512 mg/ℓ	512.8 mg/ℓ	519 mg/ℓ	519.8 mg/ℓ

Source: USDI, 1979 and Hansen, 1980a.

White River

Utah White River, Taylor Draw, and Wolf Creek Reservoirs

The 17,470 acre-feet of water per year for the power plant could be taken from either the proposed Utah White River Reservoir (Bonanza site); or the proposed Taylor Draw or Wolf Creek Reservoirs (Rangely site). Other water withdrawal from the White River could total 2.3 cfs (1,681 acre-feet) (1.42 acre-feet for municipal use at Rangely, 304.8 acre-feet for use at the mine, and 1,375 acre-feet for the slurry pipeline).

The potential reduction in firm annual yield of the White River Reservoirs and flow of the White River is summarized in table 4-7. The reduction in flow in the Green River caused by withdrawals from the Utah White River Reservoir could be lowered if Deseret purchased water from Flaming Gorge for release into the Green River. Reduced flows in the White River would not be mitigated. Water temperature would be reduced below the Taylor Draw and Wolf Creek Dams and the natural flow would be altered.

Even without the Moon Lake project, the cumulative effects of all developments and withdrawals on the White River could increase salinity by 13 mg/ℓ from 445 mg/ℓ to 458 mg/ℓ in the year 2000 (USDI, 1979).

Withdrawal of water by Deseret would have essentially no effect on the TDS increases of the White River because there would be no return flow into the river. Some impact is expected on the Green and Colorado Rivers since a diversion from the White River would mean that less higher quality water (lower TDS) would flow into the poorer quality (higher TDS) Green River, and consequently, less diluting of the Green River water would take place.

It is estimated that if 17,470 acre-feet per year were withdrawn from the White River, the TDS level of the Green River would increase by about 0.33 mg/ℓ (Hansen, 1980c). Any of the reservoirs on the White River would reduce sediment load downstream and minimum flows would probably increase. The White River Reservoirs would change downstream water temperature and pH. It is unlikely that pH would drop below 7 or exceed 8.5 (Hansen, 1980c). With proper design for selective water withdrawal, water temperature and pH could be adjusted to any desired condition. These effects were analyzed in the White River Dam Project Draft EIS, published November, 1980.

Purchase of Water for the Rangely Plant Site

Assuming 50-percent consumptive use, 34,000 acre-feet (47 cfs) of agricultural irrigation water could be purchased on an as-needed basis to supply Moon Lake project requirements. In addition to their existing 6 cfs water right on the White River, Deseret could purchase 16 cfs from the Town of Rangely.

The agricultural water would be used as backup and withdrawn from the river as required to meet project needs. The reduction in White River flows that would occur is not known, but could be as much as 40 to 50 percent. Salinity would be reduced through elimination of irrigation return flows that are typically high in TDS.

FLOODPLAINS

No power plant or raw material supply system alternative would cause a flood hazard nor would they cause important compromises to the natural and beneficial values served by the floodplains. Effects on the wetland/riparian areas associated with the floodplains are discussed in the Vegetation section.

VEGETATION

VEGETATION TYPES

The acreages which could be disturbed and occupied by the proposed and alternative project components are listed in table 2-1.

It is assumed that all vegetation within the proposed Bonanza or alternative Rangely plant sites would be cleared by heavy excavating equipment. The duration of loss of this vegetation would be approximately 10 to 20 years beyond the life of the project. Likewise, the acres occupied by proposed and alternative coal and water supply alternative structures would cause displacement of vegetation for at least the same period of time.

The acres disturbed would be modified to the extent needed to accomodate the installation of selected facilities. Heavy excavating equipment would be used to prepare the right-of-way and it is assumed that all disturbed areas would initially be cleared of all existing vegetation. Following installation, cleared areas would be reseeded and the process of revegetation would begin within 1 year of the initial disturbance.

In general, the affected native vegetation types are common and widespread and would reestablish on disturbed areas approximately 10 to 20 years after completion of mitigation. It could be expected that there could be an increase of noxious weeds in all disturbed areas.

The most signficant impact to vegetation that would be caused by construction of the proposed and alternative project components would be the loss of riparian vegetation including cottonwood trees along Kennedy Wash at the Bonanza site and Cactus Reservoir at the Rangely site and in the areas that would be submerged by construction of the Taylor Draw and/or Wolf Creek Reservoirs. Cottonwoods are limited in distribution to riparian situations and are important to wildlife. Riparian vegetation would become reestablished to some degree around the shores of the reservoir, but it would probably take 50 to 100 years to replace cottonwoods of the same size as those destroyed. Riparian areas which presently or could potentially support broadleaf vegetation in semi-arid ecosystems are of special management concern (BLM Manual 6740). Loss of riparian vegetation would be important as this would conflict with

Executive Order 11990 which provides for protection of wetland-riparian areas. Federal management policy is to avoid construction in riparian areas and to minimize loss of riparian vegetation. The acreages of riparian vegetation that would be disturbed by project components are shown in table 4-9.

If the Rangely plant site were constructed, a 980-acre artificially seeded area would be destroyed. The loss of this seeding would remove 49 animal unit months (AUMs) (39,200 lbs/year) of forage from use by livestock and wildlife (see grazing impacts in the Land Use section). In addition, about 1 acre of a 4-acre unique mountain shrub community could be removed by widening and paving the Rangely site primary access road. The loss of this community would be permanent and would result in an unquantifiable loss of scientific information.

THREATENED AND ENDANGERED PLANT SPECIES

A small but unquantified number of Uinta Basin hookless cactus (*Sclerocactus glaucus*) plants could be inadvertently destroyed during construction of the Green River to Bonanza water pipeline. Only one plant was located in the pipeline corridor during field inventories. It is the official biological opinion of the USFWS that the continued existence of the Uinta Basin hookless cactus would not be jeopardized by the Moon Lake project. Since the main population centers of this officially listed threatened species are west of the pipeline route, the species would not be adversely affected by inadvertant losses.

Of the ten candidate threatened and endangered plant species, seven have been found in relative abundance in the Uinta Basin area and have been recommended by the Utah Native Plant Society for delisting (Welsh, 1979).

Because of the abundance and dispersion of the seven species recommended for delisting, the Moon Lake project would not adversely affect these species.

Ephedra buckwheat (*Eriogonum ephedroides*--candidate threatened), Graham beardtonque (*Penstemon grahamii*--candidate endangered), and Dinosaur milkvetch (*Astragalus saurinus*--candidate threatened), have been recommended by the Utah Native Plant Society for official listing.

An unquantified number of Graham beardtongue and Ephedra buckwheat plants could be inadvertently destroyed by the construction of the electric railroad, coal conveyor, or slurry pipeline. An unknown number of Dinosaur milkvetch plants could be inadvertently destroyed by construction of the Green River to Bonanza water pipeline. It is not likely that the Moon Lake project would adversely affect these species because of the small acreage that would be disturbed by linear facilities and the selective placement of the facilities as guided by a qualified botanist. No surveys for these plant species have been conducted specifically for the Taylor Draw or Wolf Creek Reservoir sites. There is potential for any of the species listed in table 3-5 except Ephedra buckwheat, Uinta hermidium, and Graham beardtongue, to occur within the areas which could be flooded. Prior to construction of the reservoir, surveys would be made to determine if any officially listed threatened or endangered species are present.

If any threatened or endangered species are present, an environmental assessment would be done to determine if the impacts would adversely affect the continued existence of the species. If the environmental assessment predicts an adverse effect, Section 7 consultation would be initiated with the USFWS.

TABLE 4-9

Potential Loss and Disturbance of Riparian Vegetation

Project Alternative	Bonanza Site (acres)	Rangely Site (acres)
Plant Site	82	80
Coal Supply Alternative		
Deserado Mine (including alluvial wells)	40	40
Refuse Disposal Area	80	80
Coal Transportation Alternative[a]		
Electric Railroad		
Railroad Mainline	5[b]	N/A
Coal Storage and Loadout Area	0	0
Coal Delivery Conveyor	Less than 1	Less than 1
Overland Conveyor	1[c]	0
Slurry Pipeline	2[d]	N/A
Off-highway Haul Route	4[e]	0
Water Source and Transport Alternatives		
Green River Pipelines[a] (including collector well system)	30	10
Utah White River Reservoir Pipeline[a]	105	16
Taylor Draw Reservoir	N/A	50
Taylor Draw Reservoir Pipeline[a]	N/A	Less than 1
Wolf Creek Reservoir[f]	N/A	863
Wolf Creek Reservoir Pipeline[a]	N/A	Less than 1

[a]Assumes 0.25 mile corridor.

[b]Assumes 140' ROW.

[c]Assumes 100' ROW.

[d]Assumes 50' ROW.

[e]Assumes 120' ROW

[f]Riparian greasewood association.

ANIMAL LIFE

TERRESTRIAL

Mule Deer

There are few deer in the areas that would be affected by the power plant and raw material supply systems (Smith, 1979) and construction of any of the alternatives would have little effect on this big game animal. Operation of the electric railroad system for the Bonanza plant site would not result in the loss of deer because of their low density and the slow (less than 40 mph) speed of the train.

The overland conveyor system, with its accompanying maintenance road and powerlines, would not impact deer because the terrain would require adequate viaduct structures to carry the conveyor. The deer would be able to cross under these viaducts, some of which would be approximately 100-150 feet high.

The 32.7-mile slurry pipeline to the Bonanza site would be buried and could have long-term beneficial impacts to deer due to the improvement in forage composition from reseeding of the disturbed areas.

The on-highway truck haul alternative would likely increase the yearly loss of deer, but by an unknown quantity because most truck traffic would occur during the day and most deer-vehicle collisions occur at night. This impact would occur over a 3-month period in 1983 regardless of the transport method selected because trucking would be the initial method for coal transportation until the final system becomes operable. The increase in traffic associated with the project could result in an unquantifiable increase of deer deaths on well-traveled roads primarily during winter and spring months. Loss of deer from off-highway haul trucks would be minimal because slower speeds and fewer trucks would be used than with on-highway trucking.

There would be negligible losses of deer from the Rangely conveyor or truck haul alternatives because of the short distance from the mine to the power plant and because the area which would be impacted is marginal habitat and little used by deer. The Taylor Draw Reservoir would cause minimial losses to deer herd of this area. Because use within the 585 acres of critical winter range which would be inundated by the Wolf Creek Reservoir is small in relation to the total available winter range, loss of deer would not be expected. The migration of deer in the area of the Wolf Creek Reservoir would not be disrupted because the migration route is largely outside of the area that would be inundated.

Pronghorn Antelope

Construction activities at the Bonanza site would disrupt antelope reproduction during the critical fawning season (May 10 through June 20) and could reduce the population of the herd by an unquantifiable number. About 4 percent of the range of the Bonanza antelope herd would be occupied by the plant site. Any losses added to a herd which is apparently surviving in a marginal situation could eliminate the herd.

The Rangely plant site would occupy 2,202 acres of antelope summer range (see figure 3-3) and would destroy Cactus Reservoir, a permanent summer watering source. The significance of the occupied acreage to the support of the herd is probably minor because the area is at the fringes of marginal summer range. The loss of Cactus Reservoir could have detrimental effects on the herd but the degree of dependence of the herd on the reservoir is not known.

The refuse disposal area would disrupt the use of approximately 600 acres of antelope summer range over the life of the plant and hinder the migration of antelope to the southern end of summer range (see figure 3-3); however, the significance would be minor because there are not many antelope using this peripheral summer range and those that do would adapt to the changes.

The Bonanza or Rangely site coal transportation and water transport pipeline alternatives would disturb different amounts of antelope habitat (see table 3-6), but none would adversely affect antelope unless construction took place during the critical antelope fawning season (May 10 through June 20). Construction activity during the fawning season could cause abandonment of fawns and could result in the loss of 1 year of fawn production for an undeterminable portion of the herd. The long-term effects of the slurry pipeline coal transport alternative and any of the water transport pipeline alternatives would be beneficial to antelope because, after rehabilitation, the routes may produce more antelope forage than before construction.

The on-highway truck haul coal transport alternative for the Bonanza plant site would increase traffic on 31 miles of highway and could result in an unquantifiable increase in highway mortality of antelope in Utah and Colorado.

Sage Grouse

The only power plant site and raw material supply systems alternative that would affect known sage grouse use (concentration) areas are the Rangely plant site, Deserado Mine refuse disposal area, the railroad and off-highway coal transport alternative routes for the Bonanza site, the overland conveyor route to the Rangely site, and the Green River and Wolf Creek Reservoir pipelines to the Rangely site. The habitat that would be affected are shown in table 3-7. The densities of sage grouse in these areas and their importance to the survival of sage grouse is not known. Therefore, impacts to sage grouse populations cannot be predicted nor quantified. However, the absence of "leks" (strutting grounds) indicates that sage grouse populations in the potentially affected areas would not likely be lost due to construction or operation of any of the power plant or raw materials supply system alternatives.

Raptors

There would be little or no significant impact to raptors at either the Bonanza or the Rangely sites because of the lack of raptor nesting habitat. However, construction of the plant at the Rangely site could disrupt one burrowing owl nest.

The construction of facilities at the Deserado Mine portal area could cause the abandonment of one golden eagle nest. The refuse disposal area could disrupt 609 acres of habitat used by raptors as sources for their rabbit and rodent food supply, but no loss of raptors is expected. Great horned owls, red-tailed hawks, and ferruginous hawks are found throughout the project area but adverse impacts are expected to be low because there is ample nesting and feeding habitat for these birds throughout the region adjacent to impact areas.

One ferruginous hawk nest located along the railroad/off-highway truck haul route to the Bonanza site would probably be abandoned due to construction in close proximity to the nest. The impacts to raptors associated with Taylor Draw and Wolf Creek Reservoirs would be the immediate removal of some nesting habitat.

Threatened and Endangered Species

The impacts to whooping cranes from construction and operation of the power plant sites and raw material supply systems are unknown, but expected to be slight. The impacts to bald eagles and peregrine falcons would be some loss of potential food sources (prey species) and an unknown potential increase in illegal loss from shooting brought about by an increase in human activity related to the construction and operation of the project. Taylor Draw and Wolf Creek Reservoirs would beneficially impact these two species.

None of the power plant or raw material supply system alternatives would adversely affect the endangered black-footed ferret. The official biological opinion of the USFWS is that the Moon Lake project would not likely jeopardize these species.

Wild and Free Roaming Horses

Construction and operation of the applicant-proposed Bonanza site would cause the Bonanza herd (30-40 horses) to abandon approximately 1,700 acres (6 percent) of their present use area. Due to the small size of the herd and the large area available, no loss of wild horses is expected. An increase in human activity in the area could also cause an unquantifiable amount of harrassment of the herd.

AQUATIC

Green River

Threatened and Endangered Species, Game Fish, and Non-Game Fish

Maximum water withdrawal for the Moon Lake project would reduce the lowest recorded annual flow in the Green River by about 2.0 percent (see Water Resources section, Chapter 3). The minimum allowable release from Flaming Gorge Reservoir is about 400 cfs. Deseret's withdrawal of 30 cfs would reduce this amount by 7.5 percent. Water would be removed by collector wells which do not require instream activity. The possible effects of a 30 cfs withdrawal for the Moon Lake project are controversial and not agreed upon by all experts. A reduced flow could affect about 28 species of fish. Of these species, three are endangered, one is rare, and nine are considered game fish. Holden and Selby (1979b) feel that it would not adversely affect any of the 28 species of fish in the river. However, Seethaler (1978) concluded from his studies that the Green River contains the most viable remaining populations of the Colorado squawfish and that any further water development of the Green River basin could severely affect the continued reproductive success of squawfish. By itself, the Moon Lake project would not likely result in a loss of the any fish species nor adversely affect their essential habitat. However, the cumulative impact of water withdrawal for this project, as well as for the CUP (see Water Resources section, Chapter 3), could adversely affect the aquatic life in the Green River. The official biological opinion of the USFWS is that the Moon Lake project would impact the Green or White Rivers by reducing flows and is likely to jeopardize the continued existence of three endangered fish species. However, if water were purchased from Flaming Gorge, thus replacing water withdrawn from the Green River for the Moon Lake project, the endangered fishes would not be affected (see Appendix 23).

If water (30 cfs) could be obtained from Flaming Gorge Reservoir and released for use by the Moon Lake project, streamflows would not likely be adversely affected. This alternative would accomplish a USFWS goal of not allowing the flows to drop below the minimum requirements of the endangered fish. The critical amount of flow (minimum requirement) has not yet been determined. However, if increased flows did result from a changed system of release, this would create faster water which would take longer to warm up. Water volume, water velocity, and temperature may fluctuate depending upon amounts released from the Flaming Gorge Dam. The magnitude of the impact would be directly proportional to the amount of fluctuation.

A portion of the endangered fish habitat below Flaming Gorge Dam could be altered and would no longer be used by the endangered fish. However, an increase of 30 cfs in flow above the 400 cfs required release from the dam would make up for Deseret's withdrawal for the Moon Lake project and maintain endangered fish habitat below Deseret's withdrawal point. Consultation concerning this alternative has been initiated with the USFWS. The biological opinion is that if water were purchased from Flaming Gorge, thus replacing water withdrawn from the Green River for the Moon Lake project, the endangered fishes would not be affected.

White River

Threatened and Endangered Species, Game Fish, and Non-Game Fish

Assuming maximum possible direct water withdrawal from the White River (6 cfs), the lowest recorded monthly flow (62 cfs in July 1977) would be reduced by 10 percent. Flows as low as 62 cfs have been recorded only once in 43 years at Rangely; however, low flows of 54 cfs and 45 cfs have been reported from the USGS station near Watson in 1934 and 1972, respectively

Reduced flow would affect about 18 species of fish. Holden and Selby (1979a) state that "during low flows, the proposed withdrawal may impact the aquatic ecosystem to an unknown extent." They believe that the greatest change may occur in stream bottom conditions which would probably result in population changes of fish (i.e., an increase in the presence of introduced fishes, especially red shiners and an attendant reduction in native fishes). Density and diversity of other aquatic life could also be reduced as a result of flow changes. Since it appears that individual endangered and rare fishes tend to use this tributary more for travel than for maintaining reproductive areas, it is not likely that severe adverse impacts would occur. The water withdrawal by the Moon Lake project itself would not likely result in loss of fish or adversely modify habitat However, the official biological opinion of the USFWS states that the Moon Lake project would impact the Green or White Rivers by reducing flows and is likely to jeopardize the continued existence of three endangered fish species. However, if water were purchased from Flaming Gorge, thus replacing water withdrawn from the Green River for the Moon Lake project, the endangered fishes would not be affected. The cumulative effect of reduced flows in the Green River due to water withdrawal from tributaries including the White River, especially during low flows or drought periods, is of concern. In themselves, small withdrawals may not seriously impact the White River system, but together, a number of withdrawals could create serious changes in the river's ecosystem." (Holden and Selby, 1979a).

The impacts of the Taylor Draw and Wolf Creek Reservoirs on the aquatic ecosystem would be similar to those of the Utah White River Reservoir on the aquatic ecosystem in the White and Green Rivers. Because the Utah White River

Dam and Reservoir would be closer to the Green River than the Taylor Draw or Wolf Creek Reservoirs, the Draft EIS on that project provides a worst-case analysis of the impacts of reservoirs on fish in the White River. A formal consultation with the USFWS has been initiated, but a biological opinion for the project has not been received.

If the Taylor Draw or Wolf Creek Reservoirs were implemented, these dams would create barriers and block the movement of fish from the Green River. Other impacts would be the release of clear cool water from the dams and changes in the river's flow pattern. Colorado squawfish would not utilize the altered habitat (Holden, 1980).

If Deseret were to purchase agricultural water and retain it in the river as makeup for their withdrawal, the actual reduction in flows of the White River and its effects on endangered fish would be unknown. This cannot be predicted because past water use for agriculture and its relationship to historical flows in the river is unknown and operational data for the Taylor Draw or Wolf Creek Reservoirs is not available.

The Taylor Draw and Wolf Creek Reservoirs could potentially provide new habitat for game fish.

CULTURAL RESOURCES

All of the 118 sites found on the plant sites and raw material supply system alternatives could be affected by vandalism and/or inadvertent project activities resulting in a small but unquantifiable loss of scientific and educational values. A listing of cultural resource sites by project component is found in table 3-8. Whenever possible and feasible, cultural resources would be avoided by construction and related activities. If this is not possible, the BLM would consult with the appropriate State Historic Preservation Officer to determine the most satisfactory means of mitigating damage. Subsidence at the Deserado Mine could adversely affect those sites having structural features or subsurface deposits. Structural damage could occur from subsidence stresses and result in a loss of the information.

VISUAL RESOURCES AND RECREATION

VISUAL RESOURCES

Construction at either the Bonanza or Rangely site would modify the landscape character and exceed the acceptable limits of the visual resource management (VRM) objectives of the respective areas for the life of the project (see Appendix 16 for definition of VRM terms). A decision by the Federal government to implement this project would be a decision to alter the VRM objectives for the affected areas. The Bonanza plant would be of high visual contrast and visible to visitors at the Devil's Playground and travelers along Utah Highway 45 (280 ADT) and the Uintah County road to Red Wash (see figure 4-1). The Rangely plant complex would not be visible to travelers along any major highways. Both plant sites would be out of character with the open space nature of the existing landscape.

The Deserado Mine portal facilities would meet the area's VRM Class IV objectives. The refuse disposal and railroad coal storage and loadout area would modify the landscape character and would not meet Class IV visual quality objectives of the affected area for the life of the project.

The Deserado Mine to Bonanza site railroad would meet VRM Class IV objectives but would not meet Class III objectives (see figure 4-2). The railroad

FIGURE 4-1
VISUAL SIMULATION OF BONANZA PLANT SITE

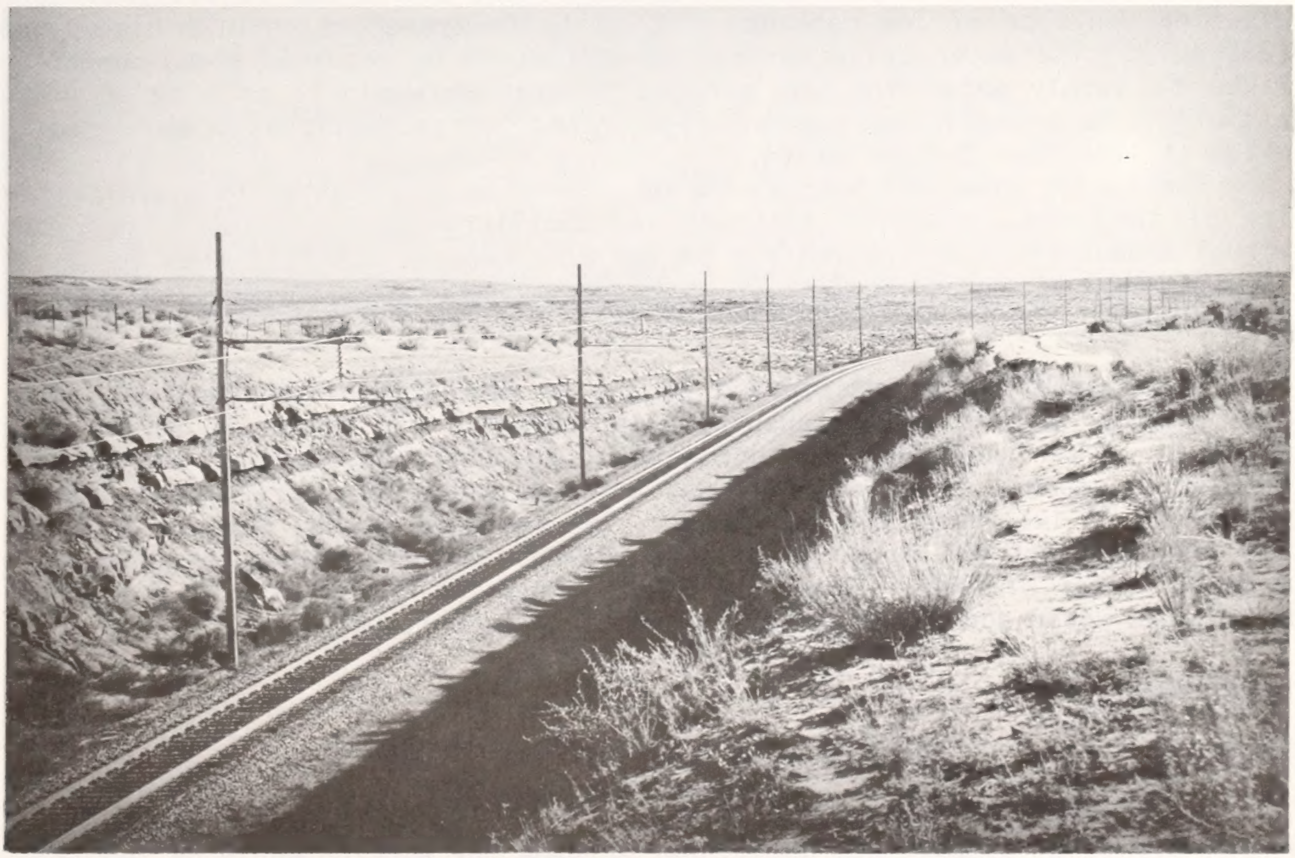


FIGURE 4-2

TYPICAL CATENARY RAILROAD SYSTEM

would be of high and moderate visual contrast to travelers on US 40 (775 ADT) for 4 miles, Colorado Highway 64 (950 ADT) for 4 miles, and Utah Highway 45 (280 ADT) for 3 miles. It would be a visual intrusion in the Devils Playground (Class B scenery, Management Class IV). The railroad coal delivery conveyor and access road from the mine to the coal storage and loadout facility would meet the affected area's VRM Class IV objectives. The railroad coal storage and loadout facilities would modify the landscape and not meet VRM Class IV objectives of the area for the life of the project.

The conveyor system and slurry pipeline to the Bonanza site would meet VRM Class IV objectives but the conveyor would not meet visual quality objectives across 1 mile of Class III area for the life of the project. The conveyor would be of high visual contrast to travelers on Colorado Highway 64 (2,000 ADT) and Utah Highway 45 (280 ADT) (see figure 4-3). It would be a visual intrusion in the Devils Playground, an area of geologic interest.

The Bonanza on-highway truck haul alternative would meet present VRM classes III and IV objectives.

The Taylor Draw Reservoir water pipeline would not meet VRM Class II objectives for 1 mile until native vegetation was reestablished (10-20 years).

The Green River to Bonanza water pipeline would meet the affected area's VRM class objectives. The Utah White River Reservoir water supply pipeline would not meet VRM objectives through 2 miles of VRM Class II area until native vegetation became reestablished (10-20 years).

The Wolf Creek Reservoir pipeline would not meet VRM Class II visual contrast objectives for 3 miles until native vegetation became reestablished. The Green River to Rangely pipeline would meet VRM class objectives. The pipeline would be of low contrast visibility to travelers on Utah Highway 45 (265 ADT). The water collector system that would be required along the Green River to supply water for the generating station would be of high contrast visibility to a small, but unquantified, number of recreational boaters (estimated at less than 200 per year).

The Taylor Draw and Wolf Creek Reservoirs would enhance the scenic quality of the area. However, the dams and ancillary facilities would not meet visual management class objectives in the affected VRM Class II area.

RECREATION

There would be no anticipated impact to recreation from the plant site, coal supply, or the coal transport alternatives. The collector wells along the Green River would add an increment of intrusion and further detract the recreation experience of a small, but unknown number of recreational boaters (estmated at less than 200 per year). The railroad to the Bonanza site and the coal conveyor to either plant site would be barriers and/or hindrances to a small number of ORVs. Construction of either the Taylor Draw or Wolf Creek Reservoirs would add to the area's recreational opportunities.

LAND USE

URBAN USE

Project-related population increases could cause housing shortages in either Vernal or Rangely and additional acreage for housing would be required. With either site, the project-related acreage requirements would be less than 1 percent of the available acreage at Rangely or Vernal. Based on urban planning and design criteria published by Dechiara and Koppelman (1975), if

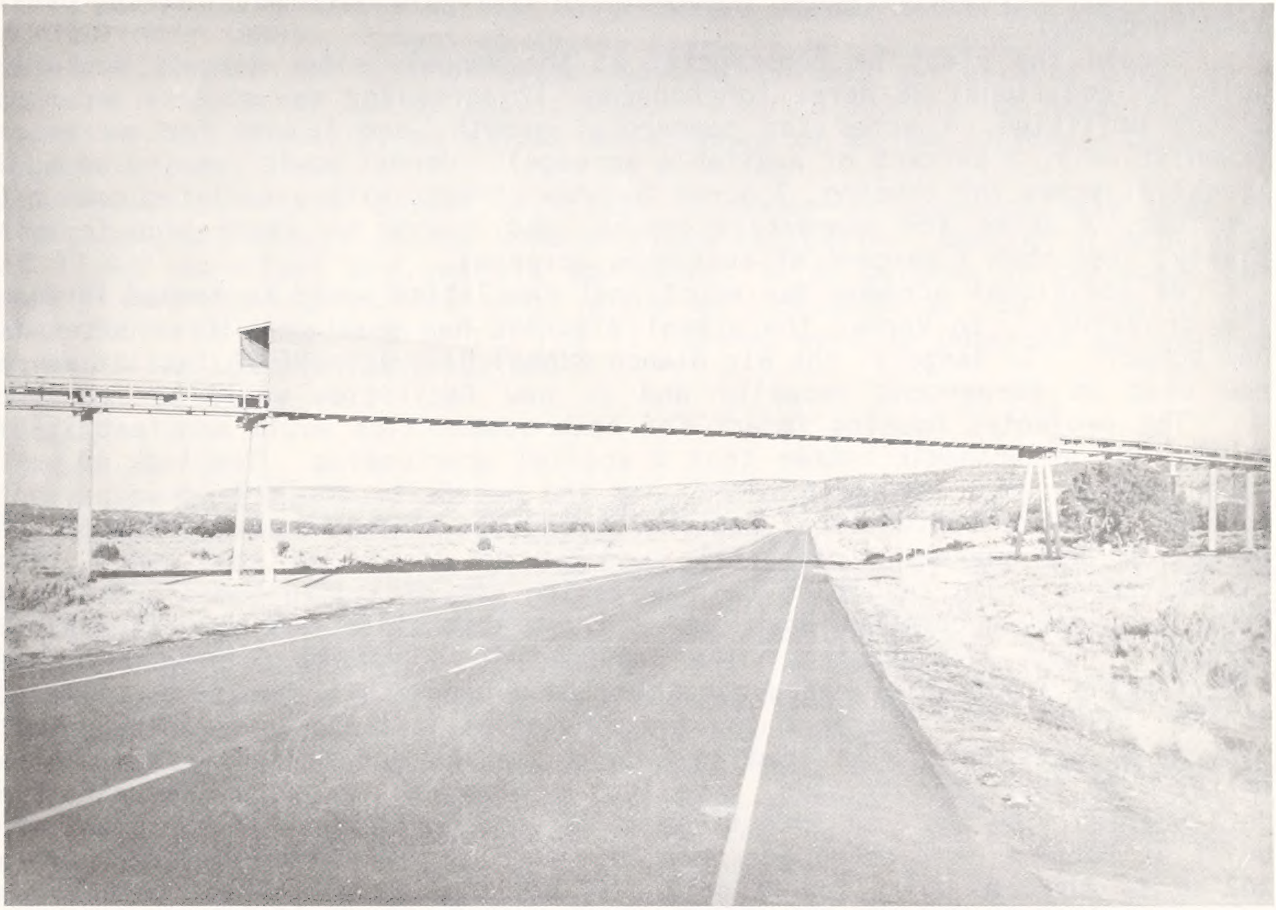


FIGURE 4-3

TYPICAL OVERLAND CONVEYOR
HIGHWAY CROSSING

the generating station were constructed at Bonanza, the peak population increase at Vernal would require an additional 36 acres for housing, 12 acres for new streets and associated utilities, 4 acres for commercial growth, and 1 acre for recreation. Cumulatively, this represents less than 1 percent of the available acreage in the Vernal/Ashley Valley area. Population increases at Rangely would require an additional 21 acres for housing, 7 acres for new streets and associated utilities, 2 acres for commercial growth, and 1 acre for recreation (cumulatively, 1 percent of available acreage including public land purchase).

Should the plant be constructed at the Rangely site, Rangely would require an additional 38 acres for housing, 12 acres for new streets and associated utilities, 4 acres for commercial growth, and 1 acre for recreation (cumulatively, 2 percent of available acreage). Vernal would require an additional 21 acres for housing, 7 acres for new streets with associated community services, 2 acres for commercial growth, and 1 acre for recreation (cumulatively, less than 1 percent of available acreage).

No additional acreage for eductional facilities would be needed in Rangely or Vernal. In Vernal the school district has purchased three sites for new schools. In Rangely, the Rio Blanco School District (RE-4) facilities are now used at 46-percent capacity and no new facilities would be required.

The projected housing impact for both communities would manifest itself as more of an economic rather than a spatial shortcoming. The lack of mortgage capital, high interest rates, and the necessity of large down payments combine to place conventional housing beyond the economic means of many construction and operating personnel expected to locate in the area. These circumstances would result in the increasing use of mobile homes and perhaps other temporary accommodations. It is known that since 1970 approximately 60 percent of all new housing units provided in northwest Colorado, an area experiencing substantial energy impacts, have been mobile homes (Susskind and O'Hare, 1977). Such quarters could be judged as less than desirable by immigrating workers and could lead to poorly planned and unsightly residential patterns on the urban fringes. The Town of Rangely has a bond issue to support availability and cost effectiveness of home mortgages. If the plant were built at Bonanza, projected peak mobile home site demand for Vernal would be 342 units and 216 units for Rangely. If built at Rangely, peak mobile home site demand would be 329 units for Rangely and 202 units for Vernal (Burns and McDonnell, 1979a).

Rio Blanco County has county-wide zoning to control indiscriminant mobile home siting, but Uintah County presently does not.

AGRICULTURE

Based on past population distribution patterns between Vernal and Ashley Valley, possible peak urban development into Ashley Valley could displace a maximum of 29 acres, or less than 1 percent of available acreage, of agricultural land. No agricultural lands would be impacted by the plant site alternatives, Deserado Mine, or coal transport alternatives.

Four ranch houses would be inundated by the Taylor Draw Reservoir. Four hundred irrigated acres of farmland would be inundated, of which 176 acres are classified by the SCS as being prime (irrigated). This represents 20 percent of the irrigated land in Rio Blanco County or 7 percent of the 2,000 acres of prime (irrigated) farmlands near Rangely. Meadow hay and alfalfa are the main crops where production losses would occur (Fleming, 1979a). Potential losses could be up to 4 tons per acre of alfalfa or 1.66 tons per acre of meadow hay (ASCS, 1980).

Four ranch houses would be inundated by the Wolf Creek Reservoir. Four hundred and three acres of irrigated land, not prime by SCS standards, would be innundated by the Wolf Creek Reservoir water supply alternative. This represents 10 percent of the irrigated land along the White River or 20 percent of the irrigated land in Rio Blanco County. Meadow hay, alfalfa, oats, and barley are the main crops where production losses would occur. This would be less than 1 percent of the Rio Blanco County annual yield of each of these crops (from both irrigated and nonirrigated lands) (Colorado Department of Agriculture, 1980). Potential losses could be up to 4 tons per acre of alfalfa, 1.66 tons per acre of meadow hay, 80 bushels per acre of oats, or 53 bushels per acre of barley (ASCS, 1980). About 5,000 lbs. of honey producton would be lost annually, at a 1979 dollar value of $3,030 (Colorado Department of Agriculture, 1980).

Annually, about 27,000 acre-feet of water is consumptively used for irrigated agriculture in the upper White River basin. Deseret's requirement of 17,470 acre-feet per year is equivalent to 47 percent of the water currently used for agriculture which gives an indication of the amount of land that could be occasionally retired if Deseret were to purchase agricultural water in the upper White River basin.

GRAZING

Less than 1 percent of the total range and pasture acres in Uintah and Rio Blanco Counties would be affected.

Forage loss from sheep allotments for the life of the project for the Bonanza site would be 150 AUMs. This amount of forage would support 63 sheep for 1 year. Disturbance would occur on the Antelope Draw Allotment, having a total carrying capacity of 6,707 AUMs, and the Bonanza Allotment, having a total carrying capacity of 2,434 AUMs. Less than 5 percent of the AUMs in either allotment would be made unavailable to livestock.

The Rangely site would remove 94 AUMs from Red Wash Allotment for the life of the project. In addition, livestock movement along Red Wash would be inhibited and the major livestock water sources, Cactus and Prairie Dog Reservoirs, would be within the fenced project boundaries.

The mine refuse disposal and railroad coal storage and loadout area would also be located predominantly in the Red Wash Allotment, removing an additional 42 AUMs. The combination of facilities would remove 30 percent of the total AUMs in the allotment. Based on present available AUMs, forage sufficient for 18 sheep per year could be eliminated.

Loss of forage production from coal transportation and water supply alternatives would be minimal, considering the small acreages occupied as compared to the total acreages available on those allotments. Table 3-10 compares the AUMs that would be removed by the power plant and raw material supply system alternatives to the total allocations in the affected allotments. The amount of loss on any one allotment (with the exception of Red Wash) would range from 1 to 8 percent of total forage production.

TRANSPORTATION

Movement of heavy equipment to the plant site would cause temporary interruptions in traffic flow and increase the potential for traffic hazards until construction at the plant site was completed.

The Deserado Mine coal transportation alternatives would greatly increase traffic volume on Utah State Highway 45, Colorado Highway 64, U.S. Highway 40, and minor secondary roads.

Expected traffic volume impact from the on-highway trucking alternative along U.S. Highway 40 between the Deserado Mine and the Bonanza plant site can be quantified by assuming use of 23-ton-capacity trucks, on a basis of a 5-day week, 8 hours per day. With one generating unit, a truck would pass a given point along the route approximately every minute. With two units, doubling the required volume, this would increase to every 30 seconds (Gellman Research Associates, Inc., 1978). Noise levels at the Town of Dinosaur would increase. Peak noise level from coal haul trucks at 35 mph or greater would be 86 dBA (weighted sound level--see Glossary), measured at 50 feet (EPA, 1971). Typical outdoor residual noise levels for rural areas are 16-35 dBA, urban residential area levels are 46-55 dBA, and very noisy urban residential and downtown city levels are 56-75 dBA. The community is currently experiencing considerable energy-related heavy truck noise; therefore, increases in frequency and magnitude would be realized. Resultant impacts on population would include interference or temporary inability in hearing and speaking and disruptions in sleep patterns or concentration. Impacts normally range from minor annoyance to serious disruption of activities (U.S. Dept. of Transportation, 1978).

High volume, high tonnage truck traffic would result in unquantifiable damage to the road surface; however, current pavement condition ratings (Colorado Department of Highways, 1979a) indicate existing deficient pavement conditions along the on-highway trucking route. Four hundred seventy-one additional round trips would be expected as a result of the on-highway trucking alternative on U.S. 40 and Utah Highway 45 during work days. This would be approximately a 323-percent increase in daily traffic on Utah Highway 45 and up to 117 percent on the affected portion of U.S. 40. Truck traffic impact analysis (Mahoney and Terrel, 1979) states that if the percentage of loaded coal trucks exceeds 10 percent of total existing truck traffic, the impact on the highway may be quite significant.

Ninety-one additional round trips would be made by coal trucks each work day during the 3-month period of 1983, regardless of the permanent method of coal transport selected. This would be approximately a 65-percent increase in daily traffic on Utah Highway 45 and up to a 24-percent increase on the affected portions of U.S. Highway 40.

Based on current accident rates on affected highways (combined property damage, injury producing, and fatality producing), the peak population year could realize an increase of 88 accidents (Colorado Department of Highways, 1979b).

Similar impacts would result on major highways over the life of the project should open market purchase of coal be utilized to supply the project. Haul distances of up to 280 miles and up to 2.7 million tons per year (117,391 trips/year) could be expected. This could occur during the final 15 years of operation if Deseret were unable to supply sufficient coal from the Deserado Mine. The off-highway truck haul alternative would employ bridge crossings at highway intersects. The only impact would be short periods of interrupted traffic flow during constuction of the bridges.

The remaining coal transport and water pipeline alternatives would cause temporary interruptions in traffic flow during construction.

Taylor Draw Reservoir would inundate 3,100 linear feet of Colorado State Highway 64 which would have to be relocated. This would cause temporary interruptions in traffic flow during construction. The relocated highway could be constructed adjacent to the high water line of the inundated section (Western Engineers, 1979a).

The Wolf Creek Reservoir would inundate a ranch suspension bridge with an exposed gas pipeline.

MINERALS

All project facilities would be subject to valid existing prior mineral rights. Those project facilities affected by these rights along with a list of the rights in question are found in Chapter 3 and table 3-11.

Transfer of the Bonanza plant site to ownership of Deseret could be accomplished only if the oil shale withdrawal were modified or lifted on the lands to be sold.

Should the site be restored to multiple use status, it would be available for appropriation. These lands are presently open under mineral leasing laws. Modification of oil shale withdrawal on the Bonanza site would not affect the existing environment.

LAND USE PLANS AND CONTROLS

Conflicts with BLM management plans noted in Chapter 3 would occur with implementation of the project alternatives are shown in table 4-10. A decision by the Federal government to implement this project would be a decision to alter the land use planning objectives listed in table 4-10.

Uintah County zoning ordinance provisions could accommodate the Bonanza plant and raw material supply systems. The Rangely plant and raw material supply systems could be accommodated under provisions of the Rio Blanco County public way and public utility land use priority zoning. The Deserado Mine operation would be permitted in the agricultural zone under provisions of a Rio Blanco County Board of County Commissioners approved special use permit.

As part of the land use planning process, BLM is preparing a report to determine if any portion of the Deserado Mine area is unsuitable for mining. The unsuitability report is not yet complete but will be included in the Final EIS. Preliminary findings indicate that the Deserado Mine area is suitable for underground mining.

SOCIOECONOMIC IMPACTS

UNIT 1 SCENARIO

This section presents the projected socioeconomic impacts of development of unit 1 of the power plant and the coal supply system including the Deserado Mine. Impacts are compared to the existing socioeconomic conditions as described in Chapter 3. The impacts of both the construction and operation of the Bonanza and Rangely sites are discussed. The effects of the power plant and mine overlap and are analyzed jointly.

Employment Projections (Unit 1)

The generating station and coal supply system would require an estimated peak work force of 1,072 in 1984. Table 2-5 shows the number of construction and operational workers that would be required from 1981 through 1985.

Permanent operational personnel would be required beginning in 1981 and would increase through 1985, stabilizing at 474 employees. A total of 172 indirect jobs are expected to be created locally as a result of this influx of permanent workers. The mining personnel would build up more gradually due to

TABLE 4-10

Conflicts Between BLM Land Use Plans and the Plant Sites and Raw Material Supply System Alternatives

Resource	Recommendation	Conflicts
Vernal District, Utah		
Wildlife	Restrict activities on antelope fawning areas, May 1-June 15.	Construction, operation, and maintenance at Bonanza site, conveyor, and water pipeline routes.
Land Uses	Restrict right-of-way to designated corridors.	Portions of conveyor, slurry pipeline, railroad, and on- and off-highway truck haul are outside designated corridors.
Recreation	Preserve open spaces. No man-made intrusions on Green River.	All project activities would introduce intrusions to open space.
Watershed	Increase ground cover.	Collector wells for Green River water source. Construction and occupancy on Bonanza site, coal and water supply systems would negatively affect ground cover.
Craig District, Colorado		
Wildlife	Improve mule deer habitat through modification of pinyon-juniper.	Activity around Deserado Mine area would displace mule deer and negate objectives of pinyon-juniper modification.
	Protect wildlife watering areas.	Deserado Mine area and Rangely site may preclude wildlife use of reservoirs.
	Restrict activities on critical antelope winter range, December 1-March 31.	Activity at the Deserado Mine area would degrade range condition and interrupt antelope use.
	Prohibit land use activity that would deter wildlife migration routing.	Conveyor belt route would cross two mule deer migration routes.

(continued)

TABLE 4-10 (concluded)

Resource	Recommendation	Conflicts
	Preserve raptor nesting and perching trees within 0.5 mile radius of active raptor nests.	Several raptor nests occur within 0.5 mile of Rangely site, Deserado Mine area, coal and water supply systems. Construction activities may conflict if trees utilized by raptors are removed.
	Prohibit land use activity within 0.25 mile of any raptor nest that would adversely impact nest productivity, March 1-July 31.	Construction and utilization of mine refuse haul road, conveyor belt, and rerouting of Staley Gordon Mine Road.
	Protect 88 miles of bald eagle habitat along White River riparian woodlands.	Deserado Mine portal would conflict with river bottom habitat by increases in human disturbance.
Land Uses	Restrict right-of-way to designated corridors.	Portions of conveyor and Rangely site are outside designated corridors.

the long lead time involved in opening the mine. Also, the addition of mine workers as plant construction employment declines would help stabilize employment and the demand for community services in the area.

Population Projections and Residential Distribution (Unit 1)

The peak construction work force would occur in 1984 and together with the operating personnel and indirect employment, the total peak population would be 2,548 people. With the passing of the peak project employment, the new population would begin to decline leaving a residual permanent population level of 1,943 individuals (approximately 497 families and 55 single individuals).

Residential distributions were projected to give an idea of where the population impacts would occur and are estimated to be within ±10 percent of actual numbers.

Bonanza Site Development

Table 4-11 lists the anticipated residential distribution pattern that would result should the plant be built at the Bonanza site.

The population changes from the peak year (1984) to the stable level (1985) are -48 percent for Vernal and +22 percent for Rangely.

Table 4-12 shows total population and percentage increases for 1981, 1984 (peak), and 1985 (stable project-related population) for Vernal, Rangely, and the two-county total.

Rangely Site Development

Should the generating station be constructed at the Rangely site, the residential distribution patterns are projected to be as shown in table 4-13.

The project-related population would peak in 1984 then decline to a stable level in 1985. This would be a 30-percent decrease from the peak for Vernal and 19 percent for Rangely.

Table 4-14 shows total population impacts on Vernal, Rangely, and the two county area.

Housing (Unit 1)

Regardless of the actual location of the plant site, increased housing demand would place a burden on the current housing supply of both Rangely and Vernal. The communities of Vernal and Rangely would either face a surplus housing situation following the peak population period or would have to contend with mobile homes or temporary camps during the peak period. However, Rangely has several new subdivisions and mobile home parks planned that are capable of containing approximately 900 units. Also, Rangely has applied for approximately 2,500 additional acres of land for development. Vernal/Ashley Valley has sufficient acreage to accommodate the housing requirements of additional people.

Bonanza Site Development

For a Bonanza site development, table 4-15 shows the approximate number of housing units required for the years 1981 through 1985. The peak housing demand attributed to the project would occur in 1984 with a total need of 770

TABLE 4-11

Projected Peak Residential Distribution[a]
for Bonanza Site Development
(Unit 1)

	1981	1982	1983	1984	1985
Vernal	313	644	970	1,267	656
Maeser	51	105	153	204	105
Rangely	263	541	678	656	802
Dinosaur	44	90	123	136	120
Jensen	23	48	76	101	51
Meeker	43	89	85	57	112
Other	39	81	109	127	97
Total	776	1,598	2,194	2,548	1,943

Source: Burns and McDonnell, 1979a.

[a]Population estimates for individual communities are expected to be within ±10 percent of the actual number of project-related people that would move into these communities.

TABLE 4-12

Population Projections for Bonanza Site Development
(Unit 1)

	Two-County Total[a]	Rangely	Vernal
1981			
Without Project	31,120	3,700	8,750
Due to Project	776	263	313
Percent Change	2.4	7.1	3.6
1984			
Without Project	50,598	9,300	11,025
Due to Project	2,548	656	1,267
Percent Increase	5.0	7.1	11.5
1985			
Without Project	47,684	9.100	12,555
Due to Project	1,943	802	656
Percent Increase	4.1	8.8	5.2

[a]Uintah and Rio Blanco Counties.

TABLE 4-13

Projected Peak Residential Distribution[a]
for Rangely Site Development
(Unit 1)

Community	1981	1982	1983	1984	1985
Vernal	234	482	636	728	513
Maeser	40	81	104	119	84
Rangely	333	687	984	1,156	942
Dinosaur	48	98	136	160	126
Jensen	16	34	44	51	37
Meeker	65	134	181	206	144
Other	40	82	109	128	97
Total	776	1,598	2,194	2,548	1,943

Source: Burns and McDonnell, 1979a.

[a]Population estimates for individual communities are expected to be within ±10 percent of the actual number of project-related people that would move into these communities.

TABLE 4-14

Population Projections for Rangely Site Development
(Unit 1)

	Two-County Total[a]	Rangely	Vernal
1981			
Without Project	31,120	3,700	8,750
Due to Project	776	333	234
Percent Change	2.4	9.0	2.7
1984			
Without Project	50,598	9,300	11,025
Due to Project	2,548	1,156	728
Percent Change	5.0	12.4	6.6
1985			
Without Project	47,684	9,100	12,555
Due to Project	1,943	942	513
Percent Increase	4.1	10.4	4.1

[a]Rio Blanco and Uintah Counties.

TABLE 4-15

Projected Peak Housing Demand
Bonanza Site Development
(Unit 1)

Housing Type	1981	1982	1983	1984	1985
			Rangely		
Single Family	19	40	58	71	97
Apartment	9	19	22	24	26
Mobile Home	36	75	87	85	92
Other	22	45	40	23	3
Total	86	180	207	203	218
			Vernal		
Single Family	23	48	84	107	81
Apartment	11	22	32	41	22
Mobile Home	43	89	124	158	76
Other	25	51	55	74	3
Total	102	210	295	380	182
			Project Total[a]		
Single Family	58	119	190	237	241
Apartment	28	57	73	85	65
Mobile Home	107	221	282	321	224
Other	65	133	129	127	10
Total	258	530	674	770	540

Source: Burns and McDonnell, 1979a.

[a]These figures include housing in communities other than Rangely and Vernal.

units. About 380 of these units would be needed in Vernal and 203 in Rangely. In 1985 the housing requirements for Vernal would be reduced by nearly 49 percent to 182 units, and Rangely's housing needs would be increased by about 7 percent to 218 units. The 1985 housing requirements would remain relatively stable for the life of the project.

Rangely Site Development

Table 4-16 shows the expected project-related peak housing demand by year for Rangely and Vernal. For Vernal, there would be a steady build-up to 1984, followed by a decline in 1985 to the permanent level of 143, a reduction of 35 percent. Rangely would show a similar pattern, reaching a peak of 380 in 1984 then dropping 31 percent to 261 in 1985.

Community Services (Unit 1)

Education

Bonanza Site Development

Student enrollment projections for both the Uintah County and Rangely (RE-4) School Districts by school year are shown in table 4-17. The project-related enrollments for the Rangely District are more constant than for the Uintah District. However, during the peak impact, which would occur in the 1983-1984 school year, the new students would make up a much larger percentage of the Rangely District students (22 percent) than of the new students within the Uintah School District (7 percent). For Rangely to maintain the present pupil/teacher ratio, 11 new teachers would have to be hired. Fourteen new teachers would have to be hired in the Uintah School District to maintain the present ratio.

Rangely Site Development

Student enrollment projections for the Uintah County and Rangely (RE-4) School Districts are shown in table 4-18. The project-related enrollments for the Rangely District are more constant than for the Uintah District. However, during the peak impact, which would occur in the 1983-1984 school year, the new students would make up a much larger percentage of the Rangely District students (29 percent) than of the new students within the Uintah School District (4 percent). If Rangely desired to maintain the present pupil/teacher ratio, 20 new teachers would have to be hired. The Uintah School District would need eight new teachers.

Sewer and Water Systems

Vernal currently operates overloaded and outdated water and sewage treatment systems. The city has begun to improve and expand both systems to a capacity of 20,000 people. However, should these improvements not be completed in time to accommodate the expected peak impact of the project, the present systems would be inadequate to handle the projected population increase.

Rangely operates water and sewage treatment facilities to handle a population equivalent of 5,000 and 6,000, respectively. These are designed for expansion to accommodate a population of 10,000. This capacity would be adequate to handle the expected population associated with the project.

TABLE 4-16

Projected Peak Housing Demand
Rangely Site Development
(Unit 1)

Housing Type	1981	1982	1983	1984	1985
			Rangely		
Single Family	28	58	88	111	117
Apartment	13	27	34	69	31
Mobile Home	52	107	127	146	109
Other	32	65	55	54	4
Total	125	257	304	380	261
			Vernal		
Single Family	12	25	53	66	64
Apartment	6	13	20	24	17
Mobile Home	26	53	81	91	60
Other	19	39	39	39	2
Total	63	130	193	220	143
			Project Total[a]		
Single Family	58	119	190	237	241
Apartment	28	57	73	85	65
Mobile Home	107	221	282	321	224
Other	64	133	129	127	9
Total	257	530	674	770	539

Source: Burns and McDonnell, 1979a.

[a]These figures include housing in communities other than Rangely and Vernal.

TABLE 4-17

Student Enrollment Pojections
Bonanza Site Development (Unit 1)

	School Years					
	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
<u>Uintah School District</u>						
District Projection	5,164	5,330	5,374	5,500	5,667	5,898
Project Impact	19	93	214	378	316	212
Total Students	5,183	5,423	5,588	5,878	5,983	6,110
<u>Rangely School District</u>						
District Projection	610	635	660	710	760	814
Project Impact	12	59	113	154	138	198
Total Students	622	694	773	864	898	1,012

TABLE 4-18

Student Enrollment Projections
Rangely Site Development (Unit 1)

	School Years					
	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
<u>Uintah School District</u>						
District Projection	5,164	5,330	5,374	5,500	5,667	5,898
Project Impact	14	66	136	222	183	168
Total Students	5,178	5,396	5,510	5,722	5,850	6,066
<u>Rangely School District</u>						
District Projection	610	635	660	710	760	814
Project Impact	16	83	178	291	260	251
Total Students	626	718	838	1,001	1,020	1,065

Fire Protection

Regardless of the generating station's location, both Vernal and Rangely would need to enlarge their volunteer fire departments to retain present fireman/population ratios. If the plant were built at Bonanza, Vernal would need about 4 and Rangely about 7 additional volunteers at peak population. If built at Rangely, there would be a need for 2 and 12 additional volunteers, respectively. Additional equipment would also be needed in both communities.

Law Enforcement

The increase in population can be expected to result in increased crime. The actual degree to which increased crime would occur cannot be predicted.

At the present time, Vernal has 13 city police officers and Rangely has 4. This is 1.8 and 2.0 officers per 1,000 population, respectively. The recommended standard of the Federal Bureau of Investigation (FBI) is 1.5 officers per 1,000 population.

Applying this standard shows the need for 1 more officer in each community to maintain that standard if the plant were built at Bonanza. If it were built at the Rangely site, the Town of Rangely would need 1 additional officer and Vernal would just approach the minimum ratio without any additional officers.

Health Facilities and Personnel

The Uintah County Hospital in Vernal and the Rangely District Hospital in Rangely are the major health care centers in the area. The administrators of each have indicated that the hospitals are currently being used at 50 and 60 percent of capacity, respectively.

At projected peak population levels in 1984, regardless of the site, each community would need at least one more full time physician. To attain their respective state averages, Vernal would need six more full-time physicians and Rangely would need four.

<u>Local Government Impacts (Unit 1)</u>

Impacts on local governments would consist primarily of the increased demand for services which would necessitate a general increase in expenditures.

The Moon Lake project would contribute to the financing of these services through taxation of project-related population and company-owned facilities. A property tax would apply to both individuals and facilities, while sales tax would be paid only by individuals.

Due to the fact that the impacts from the project are expected to cross state and county lines, there would be problems from inequitable distribution of impacts and tax revenues.

Colorado has a severence tax on coal of 35¢ per ton, therefore, Colorado would receive about $472,500 annually regardless of where the plant were located.

Cost estimates for providing county services for population increases are based on 1979 per capita costs of $725.17 for Uintah County and $1,005.87 for Rio Blanco County.

Bonanza Site Development

Analyzing the distribution (Table 4-19) for the peak year of construction shows that, if the plant were built at the Bonanza site, there would be 1,471 new residents in the Vernal area (including Maeser) and 656 in Rangely. This would mean that Rangely would have to support the impact of 279 residents related to the plant without the benefit of revenue from the plant. Correspondingly, the Vernal area would have to support the impact of 240 residents related to the mine without the benefit of revenue from the mine.

A similar situation applies to the operating workers as shown in table 4-19.

TABLE 4-19

Residential Distribution[a]
Bonanza Site Development (Unit 1)

Plant		Coal Supply System		Total	
Vernal	Rangely	Vernal	Rangely	Vernal	Rangely
Peak Construction (1984)					
1,231	279	240	377	1,471	656
Operation (1985)					
296	67	465	735	761	802

[a]Actual population for individual communities is expected to be within ±10 percent of figures shown.

Table 4-20 shows the estimated property tax revenues from the project facilities and the estimated cost and differences for each county. Revenue figures shown do not include revenue from sales and property taxes paid by project-related population, which would accrue to the local governments. As shown in the table, the plant would generate revenues in excess of the estimated costs in Uintah County while the mine would not generate sufficient revenues to cover the additional costs in Rio Blanco County.

Estimates of property tax revenue generated by Deseret-owned facilities do not include depreciation, tax credits, or exemption, etc. As such, they overestimate the actual revenue that would be realized from the project.

Rangely Site Development

If the plant were built at the Rangely site, the peak new population in 1984 in the Vernal area would amount to 847 and in Rangely, 1,156 (table 4-21). In this case, Vernal would receive 607 people due to the plant, along with 240 people from the coal supply system, and Rangely would receive 779 people due to the plant. This would mean that the Vernal area would have to support the impact of 847 people related to the plant and the mine without the benefit of revenues from any of the project facilities. However, individuals would pay property and sales taxes to the local governments where they live.

A similar situation applies to the operating workers as shown in table 4-21.

TABLE 4-20

Estimated Costs and Property Tax Revenues for
Uintah and Rio Blanco Counties
Bonanza Site Development (Unit 1)

	Uintah			Rio Blanco		
Year	Revenue (Plant)	Costs	Difference	Revenue (Mine)	Cost	Difference
1981	$ 605,000[a]	$ 304,000	$ 301,000	$ 69,000	$359,000	$-290,000
1982	2,426,000[a]	609,000	1,817,000	249,000	762,000	-513,000
1983	4,842,000[a]	915,000	3,927,000	440,000	937,000	-497,000
1984	4,750,000[a]	1,197,000	3,553,000	566,000	899,000	-333,000
1985	4,616,000	629,000	3,987,000	830,000	1,081,000	-251,000
1986	4,482,000	629,000	3,853,000	807,000	1,081,000	-274,000

[a]From the Uintah County Assessor. All other years calculated using mill rate of 35.0.

TABLE 4-21

Residential Distribution
Rangely Site Development (Unit 1)

Plant		Coal Supply System		Total	
Vernal	Rangely	Vernal	Rangely	Vernal	Rangely
Peak Construction (1984)					
607	779	240	377	847	1,156
Operation (1985)					
132	207	465	735	597	942

Table 4-22 shows the estimated property tax revenues from the project facilities (not including taxes paid by individuals) and the estimated costs and differences for each county. As shown in the table, the plant and mine would generate revenues in excess of the estimated costs in Rio Blanco County while no revenues from project facilities would be generated in Uintah County

These figures do not include depreciation, tax credits, exemptions, etc. As such, they overestimate the actual revenue that would be realized from the project.

UNITS 1 AND 2 SCENARIO

Introduction

This section presents the projected socioeconomic impacts of development of units 1 and 2 of the power plant and the coal supply system including the Deserado Mine. The impacts of both the construction and operation of the Bonanza and Rangely sites are discussed. The effects of the plant and mine overlap and are analyzed jointly.

Construction of the initial unit would begin during the first quarter of 1981 followed by the commencement of unit 2 construction in the third quarter of 1982, an 18-month lead time differential. This scenario presents the maximum impacts that would be expected to occur from the project.

Employment Projections (Units 1 and 2)

The generating station and coal supply system would require a projected peak work force of 1,613 in 1985. Table 2-6 shows the number of construction and operational workers that would be required from 1981 through 1987.

Permanent operational personnel would be required beginning in 1981 and would increase through 1987, stabilizing at 794 employees. A total of 300 indirect jobs are expected to be created locally due to this influx resulting in a total project-related permanent work force of 1,094 in 1987.

Population Projections and Residential Distribution (Units 1 and 2)

The peak construction work force would occur in 1985 and together with the operating personnel and indirect employment, the resulting total peak population would be 5,034 people. With the passing of the peak employment

TABLE 4-22

Estimated Costs and Property Tax Revenues for
Uintah and Rio Blanco Counties
Rangely Site Development (Unit 1)

	Rio Blanco			Uintah		
Year	Revenue (Plant & Mine)	Costs	Difference	Revenue	Cost	Difference
1981	$ 735,000	$ 473,000	$ 262,000	--	$222,000	$-222,000
1982	2,197,000	975,000	1,222,000	--	456,000	-456,000
1983	4,119,000	1,377,000	2,742,000	--	598,000	-598,000
1984	7,553,000	1,612,000	5,941,000	--	685,000	-685,000
1985	7,620,000	1,283,000	6,337,000	--	484,000	-484,000
1986	7,400,000	1,283,000	6,117,000	--	484,000	-484,000

Note: Revenues estimated using 1980 mill rate of 36.053.

level, the new population would begin to decline leaving an estimated residual permanent project-related population of 3,143 in 1987.

Residential distributions were projected to give an idea of where the population impacts would occur and are estimated to be within ±10 percent of actual numbers.

Bonanza Site Development

Table 4-23 lists the anticipated residential distribution by year that would result should the generating station be built at the Bonanza site.

Table 4-24 shows total population and percentage increases for 1981, 1985 (peak), and 1987 (stable project-related population) for Vernal, Rangely, and the two-county total.

With the passing of the peak in 1985, the population would decline 48 percent in Vernal and 23 percent in Rangely by 1987. Vernal and Rangely would then have approximately 36 percent and 39 percent respectively of the total permanent project-related population of 3,143. The remaining 25 percent would be distributed throughout the small communities of Uintah and Rio Blanco Counties. Overall, 47 percent of the permanent project-related population would reside in Utah and 53 percent in Colorado.

Rangely Site Development

Should the generating station be constructed at the Rangely site, the residential distribution patterns are projected in table 4-25 and table 4-26.

With this alternative, Rangely would retain about 67 percent of its peak population as permanent residents, while Vernal would retain about 57 percent. About 48 percent of the total permanent population would be in Rangely and 27 percent in Vernal. Overall, 35 percent of the permanent project-related population would reside in Utah and 65 percent in Colorado.

Housing (Units 1 and 2)

Regardless of the site's location, increased housing demand would place a burden on the current limited middle income housing supply of both Rangely and Vernal. Both communities would either face a surplus housing situation following the peak population period or would have to contend with mobile homes or temporary camps during the peak period.

Bonanza Site Development

For a Bonanza site development, table 4-27 shows the approximate number of housing units required for the years 1981 through 1987. The peak housing demand accountable to the project would occur in 1985 with a total need of 1,516 housing units. About 681 of these units would be needed in Vernal and 447 in Rangely during 1985. In 1987 the housing requirements for Vernal would be reduced by nearly 52 percent to 330 units, and Rangely's housing needs would be reduced by about 21 percent to 352 units. The 1987 numbers would remain relatively stable for the life of the project.

Rangely Site Development

For a Rangely site development, table 4-28 shows the approximate number of housing units required for the years 1981 through 1987. The peak housing

TABLE 4-23

Projected Peak Residential Distribution[a]
for Bonanza Site Development
(Units 1 and 2)

	1981	1982	1983	1984	1985	1986	1987
Vernal	311	740	1,307	1,915	2,206	2,038	1,137
Maeser	51	122	210	307	353	326	183
Rangely	261	622	761	859	1,578	1,459	1,221
Dinosaur	45	106	148	192	284	263	191
Jensen	24	57	102	153	173	159	89
Meeker	44	104	84	63	188	174	165
Other	40	94	138	180	252	231	157
Total	776	1,845	2,750	3,669	5,034	4,650	3,143

Source: Burns and McDonnell, 1979a.

[a]Figures given for individual communities are expected to be within ± 10 percent of actual number of project-related people that would settle there.

TABLE 4-24

Population Projections for Bonanza Site Development
(Units 1 and 2)

	Two County Total[a]	Rangely	Vernal
1981			
Without Project	31,120	3,700	8,750
Due to Project	776	261	311
Percent Change	2.4	7.1	3.6
1985 (Peak Year)			
Without Project	47,684	9,300	12,555
Due to Project	5,034	1,578	2,206
Percent Increase	10.6	17.0	17.6
1987 (Permanent)			
Without Project	55,502	9,100	13,283
Due to Project	3,143	1,221	1,137
Percent Increase	5.7	13.4	8.6

[a]Uintah and Rio Blanco Counties

TABLE 4-25

Projected Peak Residential Distribution[a]
for Rangely Site Development
(Units 1 and 2)

	1981	1982	1983	1984	1985	1986	1987
Vernal	239	554	806	1,066	1,457	1,318	837
Maeser	39	93	132	174	238	214	136
Rangely	332	791	1,217	1,639	2,257	2,130	1,515
Dinosaur	46	115	171	229	315	294	203
Jensen	16	39	57	75	102	93	60
Meeker	67	161	230	303	414	371	235
Other	37	92	137	183	250	230	157
Total	776	1,845	2,750	3,669	5,034	4,650	3,143

Source: Burns and McDonnell, 1979a.

[a]Figures given for individual communities are expected to be within ±10 percent of actual number of project-related people that would settle there.

TABLE 4-26

Population Projections for Rangely Site Development
(Units 1 and 2)

	Two County Total[a]	Rangely	Vernal
1981			
Without Project	27,231	3,700	8,750
Due to Project	776	332	233
Percent Change	2.8	9.0	2.7
1985 (Peak Year)			
Without Project	47,684	9,300	12,555
Due to Project	5,034	2,305	1,426
Percent Increase	10.6	24.8	11.4
1987 (Permanent)			
Without Project	55,502	9,100	13,283
Due to Project	3,143	1,515	837
Percent Increase	5.7	16.6	6.3

[a]Uintah and Rio Blanco Counties

TABLE 4-27

Projected Peak Housing Demand
For Bonanza Site Development
(Units 1 and 2)

Housing Type	1981	1982	1983	1984	1985	1986	1987
Rangely							
Single Family	19	46	61	93	134	124	132
Apartment	9	22	24	28	39	36	35
Mobile Home	36	87	102	138	216	200	171
Other	22	52	50	47	58	52	14
Total	86	207	237	306	447	413	352
Vernal							
Single Family	23	55	94	138	151	142	117
Apartment	10	25	36	51	48	44	31
Mobile Home	42	101	182	278	342	316	163
Other	25	61	92	135	138	128	19
Total	100	242	404	602	681	630	330
Project Total							
Single Family	56	137	207	280	388	356	336
Apartment	27	66	80	99	115	106	90
Mobile Home	105	255	378	473	750	689	446
Other	63	154	188	218	263	242	41
Total	251	612	853	1,070	1,516	1,393	913

Source: Burns and McDonnell, 1979a.

demand due to the project would occur in 1985 with a total need of 1,516 housing units. About 426 of these units would be needed in Vernal and 698 in Rangely during 1985. In 1987 the housing requirements for Vernal would be reduced by nearly 43 percent to 243 units, and Rangely's housing needs would be reduced by about 31 percent to 482 units. The 1987 housing requirements would remain relatively stable for the life of the project.

Community Services (Units 1 and 2)

Sewer and Water Systems

Bonanza Site Development

Vernal currently operates overloaded and outdated water and sewage treatment systems. The city has begun to improve and expand both systems to a capacity of 20,000 people. However, should these improvements not be completed in time to accommodate the expected peak impact of the project, the present systems would be inadequate to handle the projected increase.

Rangely Site Development

Rangely operates water and sewage treatment facilities to handle a population equivalent of 5,000 and 6,000, respectively. These are designed for expansion to accommodate a population of 10,000. This capacity would be adequate to handle the projected increase. However, should these improvements not be completed in time to accommodate the expected peak impact of the project, the present systems would be inadequate to handle the projected increase.

Law Enforcement

Should the generating station be built at the Bonanza site, the Town of Vernal would need an additional three officers and Rangely would need to add two officers to meet peak requirements.

With a Rangely site development, the Town of Rangely would need an additional two officers and Vernal would need one additional officer at the population peak.

These estimates are based on the FBI standard of 1.5 officers per 5,000 population.

Fire Protection

Regardless of the generating station's location, both Vernal and Rangely would need to enlarge their volunteer fire departments to retain present fireman/population ratios. If the plant were built at Bonanza, Vernal would need 6 and Rangely 16 additional volunteers at peak population. If built at Rangely, there would be a need for 4 and 24 additional volunteers, respectively. Additional equipment would also be needed in both communities.

Health Facilities and Personnel

Both Vernal and Rangely have a shortage of health care professionals. To meet minimum health care standards, Vernal would need an additional one or two doctors and Rangely would need an additional two to four doctors. These added

TABLE 4-28

Projected Peak Housing Demand
For Rangely Site Development
(Units 1 and 2)

Housing Type	1981	1982	1983	1984	1985	1986	1987
Rangely							
Single Family	28	67	95	131	185	170	163
Apartment	13	31	37	46	55	51	85
Mobile Home	52	124	169	233	344	316	215
Other	31	75	81	99	114	105	19
Total	124	297	382	509	698	642	482
Vernal							
Single Family	12	28	58	77	105	97	89
Apartment	6	15	23	27	32	29	24
Mobile Home	26	61	109	147	211	194	119
Other	19	45	57	69	78	72	10
Total	63	149	247	320	426	392	243
Project Total							
Single Family	56	137	207	280	388	356	336
Apartment	27	66	80	99	115	106	90
Mobile Home	105	255	376	473	750	689	446
Other	63	154	190	218	263	242	41
Total	251	612	853	1,070	1,516	1,393	913

Source: Burns and McDonnell, 1979a.

doctors would accommodate the increased population accruing from a development at either site. Existing hospital facilities in both communities would be adequate to accommodate the increased population.

Education

Bonanza Site Development

Student enrollment projections for both the Uintah County and Rangely (RE-4) School Districts for each school year are shown in table 4-29. During the peak impact, which would occur in the 1985-1986 school year, the new students would make up a much larger percentage of the Rangely District students (27 percent) than of the new students within the Uintah School District (9 percent).

It is estimated that the Uintah District would have to hire 21 additional teachers and the Rangely District (RE-4) 22, to maintain the present student/teacher ratios. The Uintah School District is already beyond capacity and over the long term (beyond 1987) would need up to 15 additional classrooms, while the Rangely District (RE-4) would not need additional classroom space for the project-related students (based on 25 students per class).

Rangely Site Development

Table 4-30 shows the student enrollment projections that would be realized should the generating station be constructed at the Rangely site. While the peak still occurs in 1985-86, the greatest impact would occur in Rangely. However, after the peak, Rangely would retain 84 percent of its project-related peak number of students, while Uintah would retain 76 percent. Rangely would need 34 additional teachers and Uintah 13 to maintain current student/teacher ratios at peak. Over the long term (beyond 1987), the Uintah District could require up to 11 additional classrooms while the Rangely District (RE-4) would require four additional classrooms for the project-related students (based on 25 students per class).

Local Government Impacts

Impacts on local governments would consist primarily of the increased demand for services which would necessitate a general increase in expenditures.

The Moon Lake project would contribute to the financing of these services through taxation of the project-related population and company-owned facilities. A property tax would apply to both individuals and facilities, while the sales tax would be paid only by individuals.

Due to the fact that the impacts from the project are expected to cross state/county lines, there would be problems from inequitable distribution of impacts and tax revenues.

Colorado has a severence tax on coal of 35¢ per ton; therefore, Colorado would receive about $945,000 annually regardless of where the plant is located.

Cost estimates for providing county services for population increases are based on 1979 per capita costs of $725.17 for Uintah County and $1,005.87 for Rio Blanco County.

TABLE 4-29

Student Enrollment Projections for
Bonanza Site Development
(Units 1 and 2)

	School Year						
	1980-1981	1981-1982	1982-1983	1983-1984	1984-1985	1985-1986	1986-1987
UINTAH SCHOOL DISTRICT							
District Projections	5,164	5,330	5,374	5,500	5,667	5,898	6,069
Project Impacts	19	93	248	383	460	572	376
Total Students	5,183	5,423	5,622	5,883	6,127	6,470	6,445
RANGELY SCHOOL DISTRICT (RE-4)							
District Projections	610	635	660	710	760	814	874
Project Impacts	12	59	162	179	192	317	336
Total Students	622	694	822	889	952	1,133	1,210

TABLE 4-30

Student Enrollment Projections for Rangely Site Development
(Units 1 and 2)

	School Year						
	1980-1981	1981-1982	1982-1983	1983-1984	1984-1985	1985-1986	1986-1987
UINTAH SCHOOL DISTRICT							
District Projections	5,164	5,330	5,374	5,500	5,667	5,898	6,069
Project Impacts	14	66	184	274	279	355	271
Total Students	5,193	5,386	5,533	5,709	5,873	6,222	6,269
RANGELY SCHOOL DISTRICT (RE-4)							
District Projections	610	635	660	710	760	814	874
Project Impacts	16	83	217	345	352	498	420
Total Students	626	718	877	1,055	1,112	1,312	1,294

Bonanza Site Development

Analyzing the distribution (table 4-31) for the peak year of construction shows that, if the plant were built at the Bonanza site, there would be 2,559 new residents in the Vernal area and 1,578 in Rangely. This would mean that Rangely would have to support the impact of 411 residents related to the plant without the benefit of revenue from the plant. Correspondingly, the Vernal area would have to support the impact of 764 residents related to the mine without the benefit of revenue from the mine.

A similar situation applies to the operating workers as shown in table 4-31.

TABLE 4-31

Residential Distribution[a]
Bonanza Site Development (Units 1 and 2)

Plant		Mine and Conveyor		Total	
Vernal	Rangely	Vernal	Rangely	Vernal	Rangely
Peak Construction (1985)					
1,795	411	764	1,167	2,559	1,578
Operation (1987)					
570	119	750	1,102	1,320	1,221

[a]Actual population for individual communities is expected to be within ±10 percent of figures shown.

Table 4-32 shows the estimated property tax revenue generated by the Deseret-owned facilities and estimated costs of county services (does not include taxes paid by individuals). As shown in the table, the plant would generate revenues in excess of the estimated costs in Uintah County while the mine would not generate sufficient revenues to cover the additional costs.

These figures do not include depreciation, tax credits, exemption, etc. As such, they overestimate the actual revenue that would be realized from the project.

Rangely Site Development

Table 4-33 shows the projected residential distribution by project component.

TABLE 4-32

Estimated Costs and Property Tax Revenues for
Uintah and Rio Blanco Counties
Bonanza Site Development (Units 1 and 2)

	Uintah			Rio Blanco		
Year	Revenue (Plant)	Costs	Difference	Revenue (Mine)	Cost	Difference
1981	$ 605,000[a]	$ 295,000	$ 310,000	$ 69,000	$371,000	$-302,000
1982	2,776,000[a]	702,000	2,074,000	266,000	882,000	-616,000
1983	5,866,000[a]	1,236,000	4,630,000	477,000	1,051,000	-574,000
1984	6,684,000[a]	1,812,000	4,872,000	632,000	1,178,000	-546,000
1985	8,291,000	2,086,000	6,205,000	915,000	2,171,000	-1,256,000
1986	8,653,000	1,922,000	6,731,000	1,016,000	2,012,000	-996,000

[a]Uintah County Commission, 1980. All other years calculated using mill rate of 35.0.

TABLE 4-33

Residential Distribution[a]
Rangely Site Development (Units 1 and 2)

Plant		Coal Supply System		Total	
Vernal	Rangely	Vernal	Rangely	Vernal	Rangely
Peak Construction (1985)					
907	1,125	788	1,132	1,695	2,257
Operation (1985)					
245	382	728	1,133	973	1,515

[a]Actual numbers for individual communities are expected to be within ±10 percent of figure shown.

If the plant were built at the Rangely site, the new peak population in the Vernal area would amount to 1,695 and in Rangely, 2,257. In this case, Vernal would receive 907 people due to the plant, along with 788 people from the mine and conveyor, and Rangely would receive 1,132 people due to the plant. This would mean that the Vernal area would have to support the impact of 1,695 people without the benefit of revenues from either the plant or coal supply system. However, individuals would pay property and sales taxes to the local governments where they live.

A similar situation applies to the operating workers as shown in table 4-33.

Table 4-34 shows the estimated property tax revenues from the project facilities and the estimated costs for each county. As shown in the table, the plant and mine would generate revenues in excess of the estimated costs in Rio Blanco County, while no revenues from project facilities would be generated in Uintah County to cover the additional costs due to the project-related personnel.

These figures do not include depreciation, tax credits, exemptions, etc. As such, they overestimate the actual revenue that would be realized from the project.

QUALITY OF LIFE

Community Homogeneity

In either Vernal or Rangely, the influx of newcomers into the project area could alter the prevailing social order by the importation of value systems different from that of long-time residents. Institutions whose functions comprise the organized sociocultural life, particularly religious, educational, and political, would be altered by newcomers. Long-standing channels of communication among various existing interest groups would be disrupted. The influx of workers and families would constitute a large new constituency which may have different attitudes and expectations. Consequently, previous political issues and concerns may be fragmented or replaced.

However, the project area has experienced substantial energy-related growth since World War II. Therefore, it can be expected that typical boom-

TABLE 4-34

Estimated Costs and Property Tax Revenues for
Uintah and Rio Blanco Counties
(Rangely Site Units 1 and 2)

	Rio Blanco			Uintah		
Year	Revenue (Plant & Mine)	Costs	Difference	Revenue	Cost	Difference
1981	$ 735,000	$ 470,000	$ 265,000	--	$ 224,000	$-224,000
1982	2,465,000	1,130,000	1,335,000	--	524,000	-524,000
1983	5,664,000	1,713,000	3,951,000	--	759,000	-759,000
1984	10,466,000	2,298,000	8,168,000	--	1,004,000	-1,004,000
1985	13,113,000	3,161,000	9,952,000	--	1,371,000	-1,371,000
1986	12,864,000	2,957,000	9,907,000	--	1,240,000	-1,240,000

Note: Revenues calculated using 1980 mill rate of 36.053.

town scenario impacts of conflicts between long-time residents and newcomers with resultant changes in community structures would be considerably less than in similar communities that have not had prior experiences with energy development.

Public Attitudes

Local residents would generally feel favorable toward newcomers working on energy-related projects until an unpredictable threshold of competition and apparent degradation of perceived social values would be reached.

Quality of Life Indicators

Experience with energy-impacted communities in other western states demonstrates that sudden changes in sociocultural patterns cause corresponding increases in rates of alcoholism, drug abuse, mental illness, divorce, and juvenile delinquency. Normally, these problems are experienced by newcomers unaccustomed to their new living conditions. Long-time residents would be affected most by feelings of inadequacy (Susskind and O'Hare, 1977). Informal and formal community structures would undergo stress as different institutional roles adapt to accommodate the needs of a larger and more diverse population. Interviews with long-time residents of similar energy-impacted communities have characterized their community during and after the boom period as less relaxed, friendly, traditional, isolated, harmonious, and more expensive, difficult, progressive, and competitive (Cortese and Jones, 1977). Reliable models are unavailable to do a quantitative predictive analysis of these social phenomena. Rapid population growth may be expected to produce increased incidences of social ills at a greater than proportional rate with population increases.

Increased crime would also be an evident social cost of energy-related growth. Criminal activity could be expected to involve predominantly non-violent crimes, such as burglary and vandalism, rather than crimes against persons.

Since the project area has already experienced substantial energy-related growth, the community structures have been developing to administer additional changes in sociocultural patterns.

CUMULATIVE SOCIOECONOMIC IMPACTS

Employment and population changes in Uintah and Rio Blanco Counties as a result of the proposed Moon Lake project would be moderate (see figure 4-4). However, in conjunction with other energy-related projects that could affect these counties within the same time frame, the potential socioeconomic impacts within the area could be extreme.

Eleven projects, seven in Colorado and four in Utah, have the potential of affecting some of the same area in northeastern Utah and northwestern Colorado as would the Moon Lake project (see table 4-35). In assessing the employment projections shown in table 4-35, it is important to note that for the Moon Lake project peak, projected for 1985, the power plant and Deserado Mine combined work force would amount to only 17.1 percent of the total work force of the 11 energy-related projects in the area. This would result in a relatively small proportion of the region's potential cumulative energy-related population increase. Projected new populations for the study area are shown in table 4-36.

TABLE 4-35

Cumulative Employment Projections
1981-1995

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Moon Lake PP	227	457	919	1,221	936	833	200	200	200	200	200	200	200	200	200
Deserado Mine	169	336	190	203	677	613	594	594	594	594	594	594	594	594	594
Superior	50	268	458	847	1,329	1,310	920	920	920	920	920	920	920	920	920
Ca	--	550	1,300	2,300	2,500	2,500	2,500	2,500	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Cb	--	2,098	1,774	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Paraho	--	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Colowyo	--	220	220	220	220	220	220	220	220	220	220	220	220	220	220
Anschutz	--	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Mid-Continent	--	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Geokinetics	102	137	174	212	248	284	320	358	394	430	430	430	430	430	430
TOSCO	555	1,275	1,165	720	520	520	520	520	520	520	520	520	520	520	520
White River Shale	5	205	305	705	842	400	324	324	2,308	4,500	4,700	3,800	2,300	2,050	2,050
White River Dam	300	200	10	10	10	10	10	10	10	10	10	10	10	10	10
Total	1,408	5,859	7,085	8,603	9,452	9,060	7,778	7,816	9,836	11,564	11,764	10,864	9,364	9,114	9,114

Sources: Uintah Basin Association of Governments, 1979; USDI, BLM, 1973; and Burns and McDonnell, 1979a.

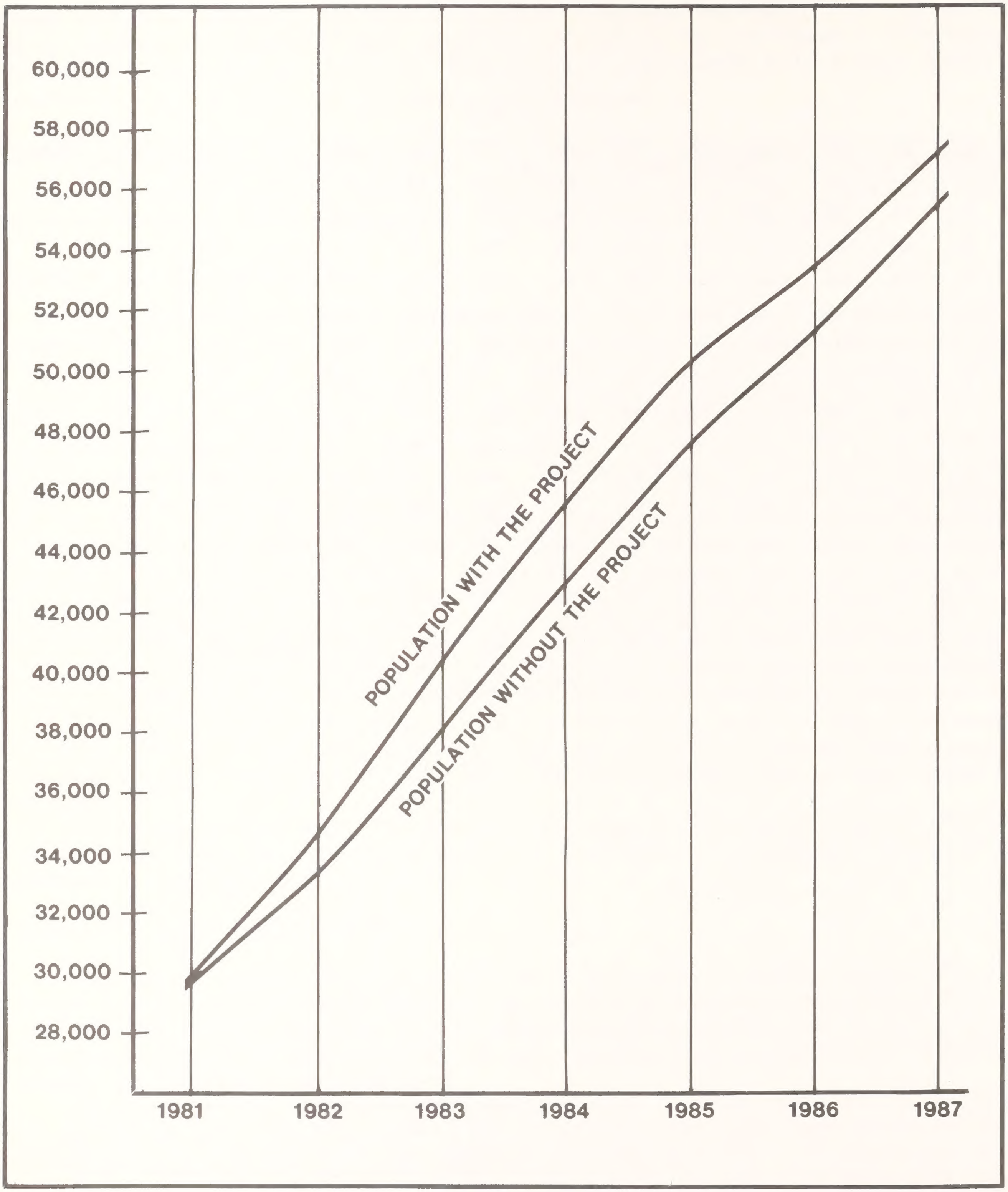


FIGURE 4-4

POPULATION PROJECTIONS WITH AND WITHOUT THE MOON LAKE PROJECT

TABLE 4-36

Cumulative Population Increase Projections

	1985	1990	1995
NE Utah	5,058	12,936	12,341
NW Colorado	15,362	12,648	11,681
Total	20,420	25,584	24,022

Source: Burns and McDonnell, 1979a.

TABLE 4-37

Total Projected New Housing Requirements
1980-1995

Years	NW Colorado	NE Utah
1980-1985	3,370	4,501
1985-1990	99	3,055
1990-1995	102	2,032

Source: Burns and McDonnell, 1979a.

Housing requirements are shown in table 4-37. The need for temporary housing and the use of camping facilities also would increase. To help alleviate adverse regional socioeconomic effects, the WRSP is planning a mobile home park, with attendant commercial and recreational facilities to be located at Bonanza (Uintah Basin Association of Governments and Utah Energy Office, 1979).

It should be recognized that all the developments most likely would not take place as scheduled or planned, thus spreading the impacts over a longer time period. In any case, the demands for housing, education, water, and other services would most likely expand to several times present capacities. The needs of local communities would outstrip their financial resources requiring them to rely on State and Federal technical and financial assistance. The present rural lifestyle would also evolve into a more urban form.

While there would be many increased costs associated with the developments, there would also be many benefits. Improved services would benefit both local and nonlocal residents of area communities. The resulting increases in retail trade and services would provide greater variety, competitiveness and possibly reduced prices due to higher volume. The sum cumulative effect of the proposed projects would be to increase the overall socioeconomic diversity of the area.

SECONDARY INFLUENCE ZONE

The recreation-related impacts that could occur within the secondary influence zone (a 2-hour driving distance from Vernal and Rangely) are based on the population projections in table 4-38.

This table shows only the projected population impacts for Rio Blanco and Uintah Counties. Other counties included in the secondary influence zone are portions of Daggett, Duchesne, and Carbon in Utah; Moffat, Garfield, and Mesa in Colorado; and Sweetwater in Wyoming. The percentages shown in the table are for Rio Blanco and Uintah Counties only and present a worst-case situation. The percent increase in population (of the entire secondary influence zone) due to the project as a whole would be significantly less than shown in the table.

All impacts in the secondary influence zone are non-mitigatable and therefore are unavoidable.

THREATENED OR ENDANGERED PLANTS

In general, adverse impacts to threatened or endangered plant species and vegetation would increase. The amount of impact is not quantifiable, but would be due to overall increased ORV use, recreational developments, plant collecting, and vandalism. There is one officially listed endangered plant species within the regional area, the Uinta Basin hookless cactus, _Sclerocactus glaucus_ (_Federal Register_ October 11, 1979). Most of its known habitat is contained within the secondary influence zone. It is estimated by the USFWS that there are about 15,000 individual plants of this species. The regional impacts of increased collecting and vandalism could have more effect on this cactus than on the other threatened or endangered plants because "cactus rustling" is a problem throughout the West.

The population increases in the zone of influence due to the proposed project are not expected to adversely affect or modify the essential habitat of any plant species. However, the combined effect of this and other projects

TABLE 4-38

Combined Population Projections
For Uintah and Rio Blanco Counties

	1985 (Project Peak)	1987
Population Without the Project		
Population Projection[a]	47,684	55,502
Increase Over Projected 1981 Population[b]	17,909	25,727
Percent Increase	60%	86%
Population With the Project		
Population Projection[a]	52,718	58,645
Increase Over Projected 1981 Population[b]	22,943	28,870
Percent Increase	77%	97%
Population Increase Due to the Project		
Increase	5,034	3,143
Percent Increase	11%	6%

Source: Burns and McDonnell, 1979a.

[a] Burns and McDonnell, 1979a and Colorado West Area Council of Governments, 1979.

[b] 1981 population projection is 29,775.

could threaten the continued existence of Sclerocactus glaucus. The USFWS biological opinion is that the Moon Lake project by itself would not likely jeopardize the continued existence of this cactus.

ANIMAL LIFE

TERRESTRIAL

The projecte-related population increase in the secondary influence zone would increase pressures on all species of wildlife. In almost all of the situations analyzed below, the secondary impacts from increased human activities brought about by the increase in human population, would probably have greater detrimental impacts on the species than construction and operation of the power plant and raw material supply systems. These impacts are largely unquantifiable with existing data. The increased need for housing and recreational dwellings often requires land which is presently serving as habitat for wildlife species. Increases in people also brings a corresponding increase in vehicle travel, which results in more vehicle-wildlife collisions.

An influx of people into the area would create a greater demand for wildlife-related recreation in the forms of game and non-game hunting, off-season shooting, and wildlife observation. The influx would also result in increased ORV use in wildlife habitats.

These activities can also increase the amount of illegal losses of game animals. In 1979, about 3,500 citations were issued by UDWR for wildlife-related offenses. Historically, the actual number of animals lost to violators is unknown (Davis, 1980), but could be significant, as studies in New Mexico have indicated that for every deer legally harvested, there is one poached (Pursley, 1977).

The hunting pressure on big game species in Colorado and Utah would also increase. Harvest of antlerless elk and deer, moose, and antelope is controlled. Hunting demand currently exceeds the available big game and the numbers of hunting permits for antlerless elk, deer, moose, and antelope (UDWR, 1978).

Reductions in the populations of big game animals from controlled harvest would be minimal, but impacts because of increased illegal killing and harassment from ORVs and sightseers would be detrimental and would cause an unpredictable or unquantifiable loss of habitat and/or animals.

Upland game and waterfowl would also be harvested; however, the actual increase in the harvest is unquantifiable.

The endangered bald eagle and peregrine falcon would be more susceptible to shooting and loss by displacement with an increase in hunting and other outdoor recreational activities in the region. Such incidental losses are not expected to adversely affect the population of bald eagles. The impact on the population of eagles would not likely jeopardize their continued existence (see Appendix 23). Only five active peregrine falcon eyries are known to exist in Utah; thus, unnecessary loss of even one peregrine could constitute jeopardy to the Utah population (Gill, 1980).

Cumulative impacts from population increases from all energy-related projects would compound the problems mentioned above. Hunting of game animals would likely be strictly controlled by issuance of permits to restrict the number of hunters. This would place greater demands on the managing agencies.

Wild Horses

The increased number of people would cause increased pressure on the Bonanza wild horse herd. This would happen because people are naturally curious and would seek them out to observe, photograph, or chase. All of these activities would harass the herd and probably cause a restriction in the amount of range the horses would use. With a restriction in available range, there would be a corresponding restriction in carrying capacity which could result in a reduction in the herd size (Evans, 1980).

AQUATIC

Peak population related to the Moon Lake project in 1987 could add about 1,700 fishermen to the area. Fish hatcheries in Utah and Colorado are presently producing at their capacities, approximately 12 and 22 million respectively, and without supplemental planting or rainbow, lake, and cutthroat trout, numbers and sizes of fish populations would decline slightly. Degradation of habitat through increased human disturbance (cutting firewood, polluting streams, and destroying vegetation) could result in more loss of fish than increased fishing pressure.

Some inadvertent losses of endangered fishes could occur as a result of increased fishing pressure; however, it is not expected to adversely affect the continued existence of these species nor adversely modify their essential habitats.

CULTURAL RESOURCES

Vandalism could be expected to increase in direct proportion to the population increase. Any damage to significant cultural resources could result in a loss of scientific and educational information.

RECREATION

Developed regional and municipal recreation sites could be expected to meet the recreation needs of the population directly associated with the Moon Lake project, assuming little or no population growth related to other factors. Dispersed recreation opportunities would also remain satisfactory.

Due to cumulative population increases, overcrowding of developed recreational facilities would occur. Popular areas obviously would receive proportionally greater use than others; campgrounds and marinas at Flaming Gorge, Steinaker, Starvation, and Strawberry Reservoirs would experience significant visitation increases from the Vernal area. Colorado state parks would experience a similar increase in use from the Rangely area.

Fifteen developed recreation sites currently at or above 40 percent of capacity would experience further degradation of facilities due to overuse (see table 3-25). Thirty-five sites currently at 20 to 40 percent of capacity would experience some degradation as well as lower user satisfaction. Sanitation problems would also increase.

Parks and open space in both Rangely and Vernal would be adequate to handle the cumulative population increase, although developed facilities would become more crowded. Municipal facilities such as tennis courts, golf courses, and handball courts would need to be expanded to maintain user satisfaction.

The cumulative impact of the projected population increase would also adversely affect all dispersed recreational activities throughout the influence zone. Reduced hunting success could lead to reduced satisfaction. Local ORV use would increase. The High Uintas Primitive Area (now proposed as wilderness by USFS) and Flat Tops Wilderness would experience additional hikers and horseback riders. Congestion would be particularly heavy at the popular trail heads. Recreational boating through Desolation, Split Mountain, Lodore, and Whirlpool Canyons would remain a satisfactory experience due to the adoption of passenger day annual use limits in the BLM and NPS River Management Plans. However, increased difficulty in obtaining the required permits would result.

TRANSMISSION SYSTEM

ROUTING ALTERNATIVES

INTRODUCTION

The following impact assessment presents a brief overview of the type of impacts that would be expected from construction of the transmission system. Table 3-27 shows the extent of the resources that would be affected by each routing alternative.

(Appendix 12 presents a numerical evaluation procedure used to analyze and compare electrical transmisson corridor alternatives.)

SOILS

Erosion hazards for the soils encountered by the transmission corridors have been identified in table 3-27. More erosion impact would occur on disturbed soils rated severe than on those rated moderate and/or slight. Overall, soil loss along transmission lines is expected to be slight because of the localized nature of the disturbance. In mountainous terrain on the Uinta and Manti-LaSal National Forest, soil erosion and loss would be accelerated by construction of access roads and by the use of these access roads and the powerline route by ORV recreation users. Extremely unstable soil exists along 4.5 miles in segment 37. Slopes are highly dissected and steep slopes average 45 percent and several are over 100 percent. The Dairy Fork route (segment 25) has approximately 5 miles of extremely unstable soils with highly dissected land forms along it. Extremely unstable soils exist along 12 miles of segment 11. Any construction in these areas would aggravate the already unstable soils. In addition, subsidence due to mining activities along segment 37 could undermine transmission tower sites.

PALEONTOLOGY

The paleontological importance of geological formations encountered by each corridor alternative have been rated and are listed in table 3-27. Scientific and educational values could be lost. The impacts to paleontology would be proportional to the amounts of high, moderate, low, or negligible paleontologically significant formations disturbed.

VEGETATION

It is estimated that about 4.2 acres/mile would be disturbed by construction. The disturbed areas would be considerably larger than areas which would remain occupied for the lifetime of the project. Reclamation of disturbed areas from tower construction and most access road construction would be carried out with revegetation or other mitigating procedures.

The removal of this much vegetation on routes traversing cultivated lands, cold desert shrub, pinyon-juniper, most riparian vegetation, wet meadow/marsh, and most mountain brush would have very little impact on the stability or productivity of these vegetation types. However, where native vegetation is cleared, there is a likelihood of introducing or causing an increase in weeds. Cold desert shrub and some pinyon-juniper areas are most vulnerable to invasion by introduced annual weedy species. Mustards, Russian thistle, locoweed, and halogeton are the most common invaders of disturbed desert or semi-desert areas. Noxious weeds, halogeton, and some locoweeds (Astragalus spp.), species are poisonous to livestock and require special control measures if they are to be kept from increasing in areas where native vegetation has been cleared. Other weeds are not poisonous but compete with native vegetation and, except for Russian thistle, are nearly worthless as forage at certain times of the year. Some alternative transmission line corridors would pass through proposed and/or listed threatened or endangered plant species habitat (see Appendix 15).

ANIMAL LIFE

Terrestrial

The impacts to terrestrial wildlife species from transmission towers and lines are variable depending primarily upon placement of towers and season of construction. Most of the negative impacts are short term because most wildlife species are not unduly affected by the existence of towers and lines. The exceptions are primarily birds which, in darkness or bad weather, can collide with powerlines and be killed or seriously injured. This is especially a problem with migrating species in concentration areas such as riparian zones, roost areas, and flyways. Because towers provide perches and resting areas, most raptor species are expected to benefit from the towers. However, if construction is done within 0.25 mile of golden eagle nests during the critical part of the nesting season (February 15 to June 15) abandonment of nests could occur. Impacts to bald eagles (endangered) and whooping cranes (endangered) would be loss of birds due to transmission line collision. The amount is unknown, but would be concentrated in major flyway and concentration areas (see figures 3-11 through 3-23).

Moose, elk, deer, and antelope would be put under stress and some losses could result if construction were to take place during winter months (December through April) in their critical ranges. Some losses of antelope fawns could occur if construction were to take place during fawning season (May-June) in critical fawning areas. The introduction of new access roads into big game critical areas would increase harrassment, hunter harvest, and illegal kills.

If construction were to take place during the sage grouse strutting (mating) season adjacent to or in the proximity of leks (strutting grounds), sage grouse production for that year could be eliminated. If towers are located within (0.25 mile) of leks, it could curtail strutting activities because of the change in predation from raptors (Welsh, 1980). In heavy

concentration areas, an unknown number of grouse may be lost from collision with powerlines. This loss of grouse would be highly variable depending upon the elevation of the lines and the elevation the grouse are accustomed to flying in the particular area where lines would be located. The location of the towers in sage grouse concentration areas would also give certain raptor species which feed on sage grouse (i.e., golden eagles and American rough-legged hawks) an advantage by providing new raptor perch sites, thus making sage grouse more susceptable to raptor predation. Construction of transmission lines through sharp-tail grouse and turkey concentration areas would have impacts similar to those on sage grouse. In segment 31, removal of trees along the Weber River would result in a loss of nesting sites and roost trees in a raptor concentration area. This is an area of special management concern.

The effect of transmission system construction on wild horses would be temporary. These animals would be forced out of habitual grazing or trailing areas for a few days or weeks. However, because horses are adaptable to temporary disturbances, it is not expected that the construction or operation of the transmission system would result in the loss of any wild horses. Only a minute portion of the total forage available to wild horses along the proposed route would be altered. In the long term, horses would benefit from the increased variety of vegetation from the reseeding of disturbed areas.

Aquatic

The important fishery streams along the alternative transmission lines are listed in table 3-27. These streams have been given fishery values that range from limited to critical fish habitat. Introduced access would lead to additional fishing pressure on certain portions of high mountain trout streams that presently have little or no access to them. More access would likely increase poaching, especially in streams trout use for spawning (e.g., Trout Creek, Strawberry River, etc.). This would reduce fish populations and cause a deterioration of the wild trout fishery. New access roads would increase the impacts associated with man's presence (e.g., litter, fire, etc.).

Caving and sloughing of streambanks and removal of riparian vegetation during construction would result in a short-term increase in turbidity and suspended solids and a short-term reduction in the quality of the fishery.

Adverse impacts on endangered and rare species in the Green and White Rivers are not expected because these fish are adapted to high fluctuations in turbidity and suspended sediment. Construction and operation of these powerlines would not likely jeopardize the continued existence of these species or adversely modify their essential habitats.

CULTURAL RESOURCES

Construction and maintenance activities associated with the transmission lines could inadvertently damage or destroy cultural resources. Increased access to the area would likely result in increased vandalism. Nine sites, two of which appear to be eligible for nomination to the National Register, were recorded along the transmission system during sample-oriented field inventories. An additional 387 sites on or near the corridors were indicated through literature searches. Only two sites are currently listed in the National Register of Historic Places and both are along segment 28 in the Canyon Pintado Historic District in Rio Blanco County, Colorado. The introduction of visual elements out of character with the Historic District would

detract from the historic setting of the district. All sites on the transmission system and their National Register status are listed in table 3-27.

Wherever possible and feasible, cultural resources would be avoided by construction and related activities. If this is not possible, the appropriate regulatory agency would consult with the appropriate State Historic Preservation Officer to determine the most satisfactory means of mitigating damage. Even with present salvage techniques, some scientific and educational information could be lost.

VISUAL RESOURCES AND RECREATION

Visual Resources

The transmission lines would cause visually adverse man-made contrast in or near visually sensitive areas such as major travel routes, primary highway crossings, high quality scenic areas, remote backcountry areas, communities, and recreation areas (see figure 4-5). The degree of additional contrast would depend on the size of the line constructed, presence of existing lines, existing scenic quality, and existing contrast.

Scenic quality would be most impaired by placing new lines of any size in undeveloped areas or by upgrading 138-kV lines to 345-kV lines.

Areas with low and medium sensitivity would be least imparied. Areas with high sensitivity would be adversely affected if the project lines were the only transmission lines placed in the area. Effects would be further increased if this new construction resulted in the area being designated as a transmission corridor for future projects.

New lines would have little effect on areas with high existing contrast. Areas with low or medium contrast could be raised one category higher (i.e., low contrast to medium contrast).

With construction of the transmission system, the USFS would be unable to maintain visual quality objectives for segments 11, 22, 24, 30, 31, 35, and 37 if lines were built there.

Recreation

Transmission line construction access roads would create access to new areas for hunters, fishermen, and ORV users, thereby increasing the variety and quality of their recreational opportunity.

Specific recreation sites including scenic roads impacted by transmission lines are summarized in table 3-27. These transmission lines would be an aesthetic intrusion to visitors at the recreation sites and the dispersed recreation backcountry along the routes. Approximately 12 miles (mileposts 35-47) of segment 35 on the Ashley National Forest crosses an area utilized for backcountry recreational experiences.

The recreational conflicts with segment 37 are snowmobile use and play areas, organized summer campsites, summer home developments, two potential recreation sites, and a scenic area along the Skyline Drive where the corridor crosses the Skyline Drive road at milepost 22.6.

LAND USE

Farming and grazing activities would be temporarily disrupted if the construction period were to occur during season of use. During the life of the project, agriculture and grazing could continue within the transmission

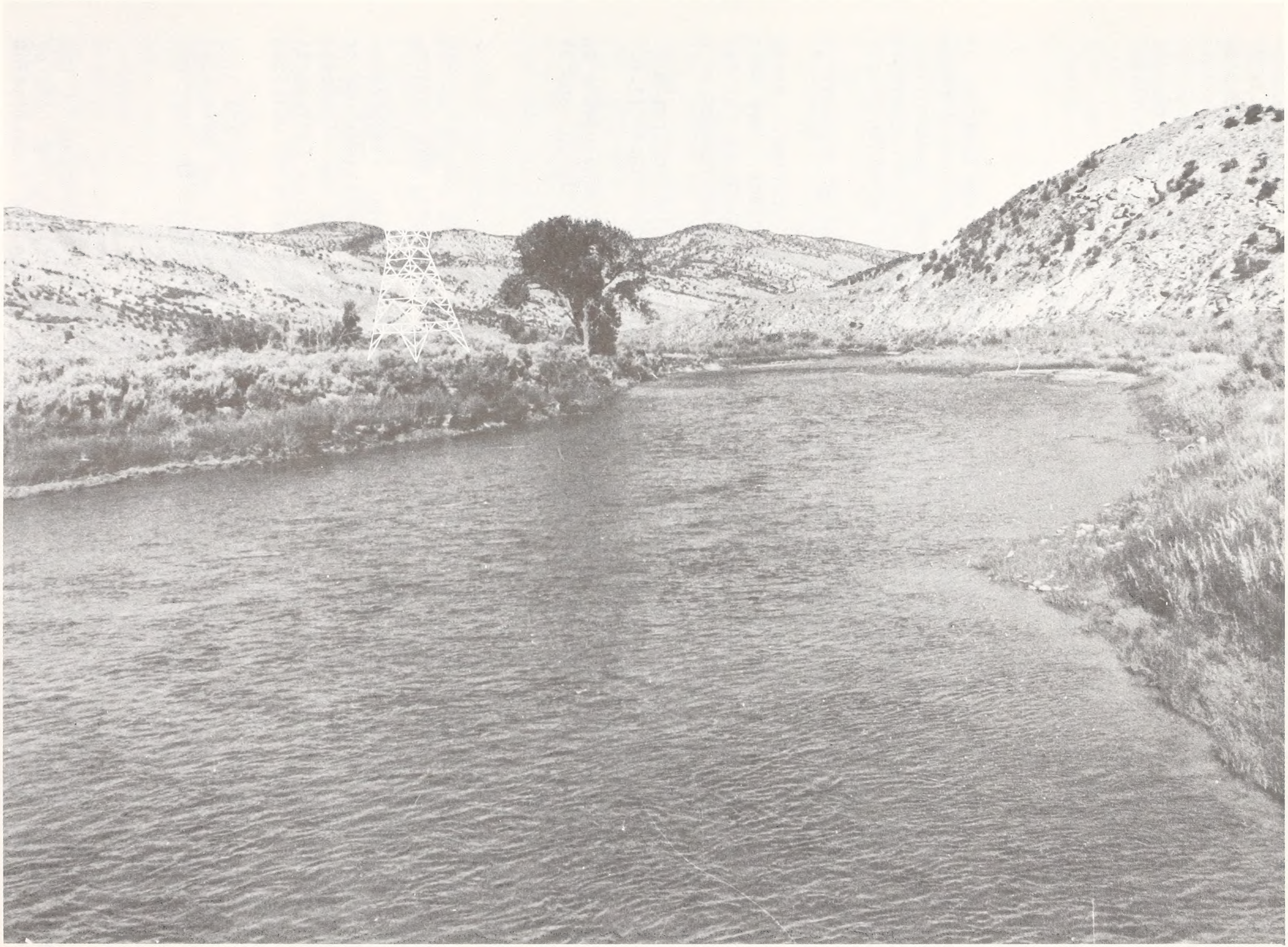


FIGURE 4-5

VISUAL SIMULATION OF TRANSMISSION TOWER

system right-of-way and, therefore, would not substantially be affected. Construction and occupancy would not cause serious loss because a maximum of 20.6 acres per mile would be disturbed by construction activity and a maximum of 0.11 acres per mile would be occupied for the life of the project.

Segment 28, at mileposts 1 through 5 and milepost 7; and segment 2, at mileposts 13 through 15, could occupy public lands that are planned for future urban expansion under a pending Recreation and Public Purposes Act applicaton by the Town of Rangely. The identification of the transmission route centerline would determine any specific conflicts with the projected urban development.

There could be a loss of prime commercial timber production along 29 miles of segment 35 in the Ashley National Forest and 6 miles of segment 37 in the Manti-LaSal National Forest. This could be as much as 150,000 board feet (valued at $300) per year on segment 35 and 30,000 board feet ($60) per year on segment 37. Timber volumes affected during the construction period could be as much as 2,537,000 board feet ($5,074) on segment 35 and 652,000 board feet ($1,304) on segment 37. Based on current minimum rates for the species involved averages $2.00 per thousand board feet live timber. Specific location, species, and volume affected during the construction period are tabulated in tables 4-39 and 4-40.

New access into USFS ORV closure areas would lead to an increase in ORV use and a loss of values for which the area is being protected (i.e., wildlife, soils, etc.). Law enforcement problems could result from the new access. Some of the areas presently closed to ORV use are unsafe to enter and enforcement of the closure would be difficult with the existence of a powerline corridor.

Segments 3, 9, and 30 could have detrimental safety effects on air navigation and aeronautical operations. Segments 7, 16, and 35 could have adverse electromagnetic effects on navigational aids. The spatial extent and magnitude of potential impacts would vary with localized atmospheric conditions.

Depending upon the centerline location of the transmission line, the segments listed in table 4-41 could detract from the scenic and recreational values of Land and Water Conservation Fund properties.

Segments 13 and 33 crossing the Green River, and segments 2, 4, and 28 crossing the White River, could conflict with the status of these rivers which are now being considered in the Nationwide Rivers Inventory.

The construction of a powerline in segement 37 would be difficult because the corridor is presently utilized by approved coal operation facilities for at least 1 mile. These facilities consist of conveyor systems, power transmission lines, buildings, coal portal areas, and attendant facilities including transportation systems. All linear facilities associated with coal operations are designed in an east-west direction. The coal operation facilities have been approved by USFWS for development. The long-wall extraction method has been approved and 50 to 90 percent of the surface is expected to subside. Powerline tower sites would be difficult to locate because of the projected subsidence over the entire Eccles Canyon area. Construction of the coal operation facilities would begin in 1981; some earth work is already underway.

LAND USE PLANS AND CONTROLS

The Draft Management Plan of the Uinta National Forest has designated 8 miles along segment 11 as unsuitable for further road construction. The Uinta National Forest Land Management Plan also includes standards and guidelines for location of utility corridors on the Forest. The location of segment 11

TABLE 4-39

Commercial Timber Areas--Segment 35[a]
Affected Standing Volume During Construction Period

Mileposts	Total Miles	Tree Species	MBF/Ac.[b]	Volume Affected (MBF)[c]	Remarks
24.5-30.0	5.5	Lodgepole Pine	8	533	The Bd ft./ac. ranges from 0-15 thousand, depending on whether segment portion has been logged or not (clear cut areas exist along the 5.5 miles).
30.5-34.5	4.0	Lodgepole Pine	12	582	
34.5-40.0	5.5	Lodgepole Pine/-Engelmann Spruce	8	533	
40.0-43.5	3.5	Lodgepole Pine (poles and scattered saw-timber)	4 (3,000 poles/ac.)	170	
43.5-52.5	9.0	Lodgepole Pine	5	545	
52.5-54.5	2.0	Douglas fir	8	174	
Totals	29.5			2,537	

[a]Important commercial timber areas on Ashley National Forest, U.S. Forest Service, occur on segment 35.

[b]MBF/Ac. = Thousand board feet per acre.

[c]Volume affected is based on assumption that total transmission line right-of-way would not be cleared. Actual cleared volume would be subject to Forest Service special use stipulation. Volume shown is 50 percent of that volume that would be involved with a total cleared right-of-way.

TABLE 4-40

Commercial Timber Areas--Segment 37[a]
Affected Standing Volume During Construction Period

Mileposts	Total Miles	Tree Species	MBF/Ac.[b]	Volume Affected (MBF)[c]	Remarks
16.5-17.0	1.5	Engelmann, Spruce, and White Fir.	25	115	[d]Losses from wind throw along power transmission line could equal 300 MBF per year for the 5.7 miles for up to 2 years.
17.0-17.6	0.6	Aspen	5	35	
18.0-18.4	0.4	Engelmann Spruce	25	115	
19.9-19.2	0.3	Spruce	25	103	
21.5-21.9	0.4	Aspen	9	41	
22.3-23.2	0.9	Aspen	9	104	
23.9-24.2	0.3	Aspen	12	44	
24.2-25.1	0.9	Aspen	5	58	
25.1-25.5	0.4	Aspen	8	37	
Totals	5.7			652	

[a]Commercial timber areas on Manti-LaSal National Forest, U.S. Forest Service, occur on segment 37.

[b]MBF/Ac. = Thousand board feet per acre.

[c]Volume affected is based on assumption that total transmission line right-of-way would not be cleared. Actual cleared volume would be subject to Forest Service special use stipulation. Volume shown is 50 percent of that volume that would be involved with a total cleared right-of-way.

[d]Wind throw losses along newly constructed power transmission lines based on local USFS knowledge and experience.

TABLE 4-41

Land and Water Conservation Fund
Park and Recreation Areas Affected by
Transmission Line Corridors

Designation of L&WCF Lands	Segments	Acres Potentially Occupied
295 H	30	0.75
66, 158	30	3.5
170, 233	36	0.75
290, 222 et al.	30	0.75
Surplus 421 K	30	0.75
295 L	36	0.75
204, 237	36	0.75
32	36	0.75
32, 125	36	1.5
284	30	0.75

would be contrary to the direction provided by these standards and guidelines. The draft management plan feasibility studies for the Manti-LaSal National Forest have designated the Skyline Drive at milepost 22.6 on segment 37 as a scenic road. Construction of transmission lines in this area would conflict with this designation.

The Vernal Planning Unit Land Use Plan on the Ashley National Forest has specific management objectives for visual quality, commercial timber, water quality, and unroaded areas. Considerable mitigating measures would be needed to eliminate or minimize conflicts.

BLM land use plan conflicts are tabulated in table 4-42.

A decision by the Federal government to implement this project would be a decision to alter the land use planning objectives listed in table 4-10.

SYSTEM ALTERNATIVES

UTAH POWER AND LIGHT (UP&L) INTERTIE

The following effects would result from Deseret providing additional funding to UP&L or helping construct double circuit towers for the Moon Lake unit 1 and Hunter 3 line, either from Tucker or from Tank Hollow, to the UP&L Spanish Fork substation.

Right-of-way requirements would be only that needed for the Hunter 3 line. These requirements would involve acres occupied by towers and permanent access roads and acres disturbed during construction. The right-of-way requirements would be 58 acres for the Tucker to Spanish Fork substation overlap and 39 acres for the Tank Hollow to Spanish Fork substation overlap.

Refer to table 3-27, and figures 3-11 through 3-23, Chapter 3 for resource descriptions and quantities along the above-mentioned overlaps. A UP&L intertie would reduce the effects on the impacted resources for these overlaps. On either of the overlaps there would be an 87-percent reduction of effects on soils, vegetation, and water. There would be a 50-percent reduction of visual contrast, but due to existing scenic quality and sensitivity levels the visual resource management class would remain unchanged. These reductions are based upon differences in right-of-way acres with or without an intertie. There would be an unquantifiable reduction of effects on animal life and cultural resources.

Construction costs for the Tucker to Spanish Fork substation intertie would be about 17-percent less than for independent construction. Construction costs for the Tank Hollow to Spanish Fork substation intertie would be about 13-percent less than for independent construction.

TOWER SHARING

There is potential for double circuit tower installation for carrying Moon Lake project lines and existing lines along 174.2 miles with the Bonanza plant site and 140.7 miles with the Rangely plant site. (Refer to table 2-9 for the description of transmission system segments with potential for tower sharing.)

There could be a reduction in right-of-way requirements for tower sharing with the existing lines. This reduction would have a corresponding reduction of effects on associated resource values.

Reduction of number of lines would reduce long-term effects on all the resources shown for segments listed in table 2-12. The amount of reduction would depend on how many existing lines and towers could be eliminated through tower sharing as well as the routing alternative.

TABLE 4-42

BLM Land Use Plan Conflicts With Transmission Corridors

Resource	Recommendation	Conflicts
Vernal District Utah		
Wildlife	Restrict activities on antelope fawning areas, May 1-June 15.	Segments 1, 3, 4, 5, 6, 14, and 18 are within antelope fawning areas.
Land Uses	Restrict right-of-way to designated corridors.	Segments 1, 2, 3, 4, 5, 12, 13, 19, 27, 29, and 33 are outside of designated corridors.
Recreation	Preserve open spaces and restrict surface disturbance and man-made improvements.	Segments 13, 33, and 35 would alter open spaces with manmade structures.
Craig District Colorado		
Land Uses	Restrict right-of-way to designated corridors.	Segments 2, 3, 4, and 28 are outside designated corridors.
	Proposed R&PP classification on C-22915 and Town of Rangely Public Sale Application C-26914.	Segments 2 and 28 would conflict with proposed urban development.
Rock Springs Wyoming		
Wildlife	Restrict activities on sage grouse nesting/strutting grounds (leks), March 1 to June 15.	Segment 35 is within strutting grounds.
	Restrict activities on active golden eagle nesting sites, March 1 to July 1.	Segment 35 is within active golden eagle nesting sites.
	Restrict activities on critical deer winter range, December 15 to April 15.	Segment 35 is within critical deer winter range.
	Restrict activities on critical moose winter range, December 15 to April 15.	Segment 35 is within critical moose winter range.
Cultural Resources	No surface disturbing activities within 0.25 mile of historic emigrant trail.	Segment 35 crosses historic emigrant trail.

DOUBLE CIRCUITING

Spanish Fork Substation

This alternative would require only a 170-foot right-of-way instead of the 300-foot requirement for two separate lines. Most of the impacts would occur during the construction phase of unit 1. The unit 2 circuiting would take place later with a minimum of impacts to the various resources. The most significant impact reductions would be on impacts to soil, watershed disturbance, and the visual degradation. A double circuit 345-kV system requires about 7-percent less investment than construction of two independant 345-kV systems. However, initial investment costs of a double circuit system would be 85-percent per mile more than installation of a single circuit system and there is no assurance that the unit 2 line would be placed on these towers. Adding unit 2 circuits would require the reopening of temporary access roads or stringing circuits by use of helicopter and the resulting impacts.

There would not be additional impacts to the environment on the segment involving the 138-kV system to the Upalco substation. With or without double circuiting of the 345-kV lines, a new 138-kV line would be installed on new towers. See Appendix 5, tables B-H for the acreage and miles of corridor involved in this alternative.

Mona Substation

Discussion of impacts under the above double circuiting to Spanish Fork substation also applies here. The UP&L wheeling alternative could be used to deliver power to the Wasatch Front from the Mona substation or Deseret could construct a 345-kV single circuit line up the Wasatch Front to the Ben Lomond substation.

The wheeling arrangement would have no known changes on the existing physical or biological environment of the Moon Lake transmission system. Over the 35-year life of the project, wheeling costs would be about 52-percent less than construction of the Wasatch Front segment 36.

Refer to table 3-27, and figure 3-22, for resource descriptions and quantities along the Wasatch Front route.

UP&L-DESERET COOPERATIVE WHEELING

Construction of a double circuit 500-kV line through Spanish Fork Canyon could handle the projected load for the planned independent 345-kV line for the Hunter Plant, two 345-kV lines for the Moon Lake power plant and two future 500-kV transmission lines for UP&L operation.

Construction of the double circuit 500-kV line would reduce the right-of-way requirements that would be needed for the five lines identified above. For the Moon Lake project, this reduction would be similar to that discussed under the above UP&L Intertie discussion. The actual right-of-way requirements would be a small increase in that needed for the planned Hunter 345-kV line. As with the UP&L intertie, there would be a similar long-term reduction of effects on soils, vegetation, water, and visual contrast. The visual resource management class would remain unchanged. The amount of reduction of effects on animal life and cultural resources would also be unquantifiable.

Construction costs per mile for the double circuit 500-kV transmission system would be approximately 10-percent less than the three independent 345-kV lines.

SPECIFIC MITIGATING MEASURES UNIQUE TO THIS ACTION AND REQUIRED OF THE APPLICANT BY FEDERAL AGENCIES

Authority for requiring the following mitigating actions is granted under the same authority as described in Chapter 2 for standard measures.

If the proposed project were approved, the applicant, under Federal law, would be required to carry out the following on federally administered lands. Deseret would, when restoring or rehabilitating areas disturbed by the construction of the transmission lines, pipelines, and associated access roads across private lands, use the same reclamation measures as required by land managers of adjacent Federal lands or reclamation measures as requested or required by the private landowner (Deseret, 1980).

All mitigating measures listed below could be modified as deemed necessary by the appropriate Federal official in cooperation with responsible state agencies.

1. All unpaved roads affected by truck coal haul alternatives will be treated or paved to reduce dust emissions.

2. New permanent sources of water will be provided by Deseret in the vicinity of the Bonanza plant site to offset loss of antelope habitat. The number, location, and method of water supply will be determined in conjunction with the UDWR and BLM.

3. The Rangely plant site boundary will be adjusted so as to allow a 0.25 mile buffer zone around Cactus Reservoir. Cactus Reservoir will be excluded from the plant site right-of-way or sale area and no use of the reservoir for the project will be allowed.

4. The access road to the Rangely plant site will be placed so as to avoid disturbance of a unique vegetation type located about 200 yards west of Red Wash.

5. Should the project be approved, a wildlife mitigation plan for all project facilities will be developed jointly by the BLM, USFWS, UDWR, CDW, and Deseret as required by the Fish and Wildlife Coordination Act.

6. A minimum clearance of 6 feet will be provided at least every 0.25 miles along the Deserado Mine to Bonanza or Rangely plant site overland conveyor. This requirement could be modified through site specific monitoring and a mitigation plan drawn up in conjunction with BLM and the UDWR for Utah portions of the conveyor and BLM and the CDW for the Colorado portion of the conveyor.

7. Construction of linear facilities associated with raw material supply systems will cease in critical antelope fawning areas during the critical antelope fawning period (May 10 to June 20). Table 4-43 lists the critical antelope fawning areas.

8. During critical periods, transmission line construction will cease in essential wildlife habitats. Table 4-44 lists essential habitats and periods of concern.

TABLE 4-43

Critical Antelope Fawning Areas
Along Raw Material Supply System Linear Facilities
(May 10 to June 20)

Alternatives	Critical Area	Mileposts
Coal Transportation (miles)		
Bonanza Site		
Railroad	4	31-35
Overland Conveyor	4	25-29
Slurry Pipeline	4	27-31
Off-highway Truck	4	33-37
On-highway Truck	4	0-4
Water Source Alternative (miles)		
Green River Bonanza Pipeline	4	0-4
Utah White River Reservoir Pipeline	4	0-4

TABLE 4-44

Transmission System Critical Wildlife Areas and Time Periods

Segment Number	Species	Concern	Action or Mitigation Period	Mileposts
1	Antelope	Fawning	5/10 to 6/20	0-4
2	Waterfowl and bald eagles	Collision with lines	Mark lines.	0-2
3	Antelope	Fawning	5/10 to 6/20	0-4
4	Waterfowl and bald eagles	Collision with lines	Mark lines	0-15; 8-9.5
5	Antelope	Fawning	5/10-6/20	0-4
7	Waterfowl and bald eagles	Collision with lines	Mark lines	0-2
9	Waterfowl and bald eagles	Collision with lines	Mark lines	0-2
9	Mule deer	Fawning	5/1-6/30	6.5-18
9	Sage grouse	Concentration area		11-12
10	Golden eagle	Nesting	3/1-4/31	10-15
10	Waterfowl	Collision with lines	Mark lines	12-14
10	Mule deer	Critical winter range	12/1-4/30	0-15
11	Deer and elk	Critical winter range	12/1-4/30	24-29
11	Deer and elk	Fawning/calving range	5/1-6/30	5-23
12	Antelope	Fawning	5/10-6/20	0-23
13	Whooping crane, waterfowl, and bald eagles	Collision with lines	Mark lines	0-9; 22-27
15	Sage grouse	Concentration areas	3/1-4/30	0-9.5
17	Waterfowl	Collision with lines	Mark lines	5.3-6.3

TABLE 4-44 (continued)

Segment Number	Species	Concern	Action or Mitigation Period	Mileposts
19	Sage grouse	Concentration area	3/1-4/30	29-39
19	Deer and elk	Critical winter range	12/1-4/30	25-65
20	Deer and elk	Critical winter range	12/1-4/30	0-8.8
21	Deer and elk	Critical winter range	12/1-4/30	0-7.5
22	Deer	Critical winter range	12/1-4/30	10-23
23	Deer and elk	Critical winter range	12/1-4/30	0-15.5
24	Sage grouse	Concentration area		1.7-3.7
24	Deer	Critical winter range	12/1-4/30	0-16
24	Elk	Critical winter range	12/1-4/30	0-3.5; 5.7-16
25	Deer and elk	Critical winter range	12/1-4/30	0-17; 18-22
25	Deer and elk	Fawning/calving range	5/1-6/30	22-23
26	Deer	Critical winter range	12/1-4/30	5-25
26	Sage grouse	Concentration area	Winter	5-15
27	Waterfowl and bald eagles	Flyway	Mark lines	8-8.9
28	Waterfowl and bald eagles	Flyway	Mark lines	0-7; 10-11; 13-14
29	Antelope	Fawning	5/10-6/20	0-4
30	Waterfowl	Collision with lines	Mark lines	42.4-43.1; 52.9-54.9; 58.9-68.9

TABLE 4-44 (concluded)

Segment Number	Species	Concern	Action or Mitigation Period	Mileposts
30	Moose	Critical winter range	12/1-4/30	0-4.9; 53-92.6
30	Deer and elk	Critical winter range	12/1-4/30	0-23; 52-52.9
30	Sage grouse	Concentration area	Winter	0-23; 44-66
31	Deer and elk	Critical winter range	12/1-4/30	0-8
33	Waterfowl and bald eagles	Flyway	Mark lines	4-5
35	Waterfowl	Flyway	Mark lines	18.7-69.2; 84.2-93.2; 102.5-103.5; 133.2-135.2
35	Moose	Critical winter range	12/1-4/30	24.7-69.2; 89.2-94.2; 134.2-149.2
35	Deer and elk	Critical winter range	12/1-4/30	12-25; 57-65; 119-137; 147-160.7
35	Sage grouse	Concentration area	3/1-4/30	70-85; 95-105; 146-160.7
35	Sharptailed grouse	Concentration area	3/1-4/30	146-160.7
36	Deer and elk	Critical winter range	12/1-4/30	0-7
36	Waterfowl	Flyway	Mark lines	67-82
37	Deer and elk	Critical calving-fawing area	5/1-6/30	16.5-22.0
37	Deer and elk	Critical winter range	12/1-4/30	25-27.8
37	Moose	Critical winter range	12/1-4/30	6-17
37	Waterfowl	Roosting and nesting	Mark lines	21.5-22.5

9. Transmission lines will be marked by attaching colored balls in avian flyways as listed in table 4-44.

10. The Deserado Mine to Bonanza plant site overland conveyor (mileposts 25 to 29), slurry pipeline (mileposts 27 to 31), or truck haul routes (mileposts 0 to 5.5 on-highway, 33 to 37 off-highway) will be placed along the southern boundary of the identified corridors to avoid the Devils Playground.

11. Surface activities associated with mining will not be allowed in Scullion Gulch between the portal area and the ventilation entry so as to protect a golden eagle nest.

12. Transmission lines should be placed within the 1-mile-wide corridor as indicated in table 4-45 to avoid important land use facilities and areas.

EFFECTIVENESS OF SPECIFIC MITIGATING MEASURES

Road dust that would result from trucking of coal would not be completely eliminated through treatment but would likely be reduced to an acceptable level.

It is the opinion of the UDWR that a limiting factor to the Bonanza antelope herd is the availability of water. New sources of permanent water may actually improve conditions for antelope. Excluding Cactus Reservoir from the Rangely plant site would allow continued use of the reservoir by livestock and wildlife. The conveyor would no longer be a barrier to livestock and wildlife. The measures for time constraints on construction would essentially eliminate harassment of wildlife during the critical periods but waterfowl and other birds could still collide with transmission lines.

Land use conflicts would be avoided with proper placement of the system within the 1-mile-wide corridor.

TABLE 4-45

Land Use Facilities and Areas Along the Transmission Corridors

Segment Number	Mileposts	Concerns	Mitigation
2	13-15	Town of Rangely Recreation and Public Purpose Application.	Locate transmission lines to the south edge of the corridor.
2	8	White River Crossing Nationwide River Inventory	Consultation with Heritage Conservation Recreation Service.
3	5	Bonanza Air Strip	Locate transmission lines away from airports and navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
4	1-4	White River Crossing Nationwide Rivers Inventory	Consultation with Heritage Conservation Recreation Service.
7	20-25	Very high frequency (VOR) station omni directional range.	Locate transmission lines away from air navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
9	10	Duchesne Municipal Airport.	Locate transmission lines away from airports and navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
9	15-20	Starvation Reservoir right-of-way.	Locate transmission lines to the north and west edge of the corridor.
11	10-15	Aspen Grove Campground	Locate transmission lines to the north or south edge of the corridor.
13	22	Green River Crossing Nationwide Rivers Inventory.	Consultation with Heritage Conservation and Recreation Service.

TABLE 4-45 (continued)

Segment Number	Mileposts	Concerns	Mitigation
16	10-15	Very high frequency (VOR) station omni-directional range.	Locate transmission lines away from air navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
22	13	Strawberry Highland Canal	Locate transmission lines to the south edge of the corridor.
28	1-5	Town of Rangely Recreation and Public Purpose Application.	Locate transmission lines to the south edge of the corridor.
28	2,8	White River Crossing Nationwide River Inventory.	Consultation with Heritage Conservation and Recreation Service.
30	80	Morgan Municipal Airport	Locate transmission lines away from airports and navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
31	11	City of Riverdale Park and Recreation Area (Surplus 421k)	Locate transmission lines to the north edge of the corridor.
31	14	Land and Water Conservation Fund (L&WCF) Park and Recreation Area 292 et al.	Locate transmission lines to the south or west edge of the corridor.
31	13	Land and Water Conservation Fund (L&WCF) Park and Recreation Area 295 H.	Locate transmission lines to the west edge of the corridor.
31	12	Land and Water Conservation Fund (L&WCF) Park and Recreation Areas 66, 158.	Locate transmission lines to the west edge of the corridor.
31	6	Land and Water Conservation Fund (L&WCF) Park and Recreation Areas 290,222 et al.	Locate transmission lines to the south edge of the corridor.

TABLE 4-45 (continued)

Segment Number	Mileposts	Concerns	Mitigation
33	5	Green River Crossing Nationwide Rivers Inventory.	Consultation with Heritage Conservation and Recreation Service.
35	24.5-54	Commercial timber production area.	Specific clearing and maintenance of corridor for forest products.
35	5-10	Very high frequency (VOR) station omni-directional range.	Locate transmission lines away from air navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
35	1-5	Direction finding (DF) antenna.	Locate transmission lines away from air navigational aids. Submit Notice of Proposed Construction (FAA Form 7460-1) to Federal Aviation Administration.
36	105	Land and Water Conservation Fund (L&WCF) Park and Recreation Area 170, 233.	Locate transmission lines to the west edge of the corridor.
36	100	Land and Water Conservation Fund (L&WCF) Park and Recreation Area 295 L.	Locate transmission lines to the west edge of the corridor.
36	95	Land and Water Conservation Fund (L&WCF) Park and Recreation Areas 204, 237.	Locate transmission lines to the west edge of the corridor.
36	55	Land and Water Conservation Fund (L&WCF) Park and Recreation Areas 32.	Locate transmission lines to the west edge of the corridor.
36	50	Land and Water Conservation Fund (L&WCF) Park and Recreation Areas 32, 125.	Locate transmission lines to the east edge of the corridor.

(continued)

TABLE 4-45 (concluded)

Segment Number	Mileposts	Concerns	Mitigation
37	21.6	Gooseberry Campground.	Locate transmission lines south edge of corridor.
37	19.4 & 21.0	Summer House Development.	Locate transmission line near southern edge of corridor.
37	19.6	Organizational Summer Camp.	Locate transmission line as far to north of corridor as possible.
37	15-21	Commercial Timber Production Area	Specific clearing and maintenance of corridor for forest products.

CHAPTER 5
CONSULTATION AND COORDINATION

INTRODUCTION

This draft environmental impact statement (EIS) has been prepared jointly by the Bureau of Land Management (BLM) and Rural Electrification Administration (REA). A memorandum of understanding outlining the responsibilities of the two agencies was signed on November 19, 1979.

The following agencies were requested by BLM and REA as participating agencies to review the company-prepared environmental analysis and provide expertise in preparation of the Draft EIS:

<u>Participating Agencies--Federal</u>

Environmental Protection Agency
U. S. Army Corps of Engineers
U. S. Forest Service
U. S. Geological Survey
U. S. Fish and Wildlife Service
National Park Service
U. S. Bureau of Indian Affairs
Office of Surface Mining
Heritage Conservation and Recreation Service
Water and Power Resources Service
Federal Aviation Administration
Federal Communications Commission
Federal Energy Regulatory Commission
Federal Highway Administration

<u>Participating Agencies--State</u>

Utah Public Service Commission
Utah Division of Health
Utah Division of Lands
Utah Department of Transportation
Utah Energy Office
Utah Department of Natural Resources
Colorado Department of Health
Colorado Public Utilities Commission
Colorado Department of Natural Resources
Colorado Department of Local Affairs
Colorado Department of Highways
Wyoming Division of State Lands

Other agencies which will be included in the data gathering and/or EIS review process are:

Western Area Power Administration
Soil Conservation Service
Advisory Council on Historic Preservation

Utah State Historic Preservation Officer
Colorado State Historic Preservation Officer
Wyoming State Historic Preservation Officer
Wyoming Department of Natural Resources
Various local governments in Utah, Colorado, and Wyoming

SCOPING

Three scoping meetings have been held by BLM-REA and Deseret Generation and Transmission Cooperative (Deseret) to identify the significant issues related to the project. These meetings were held at Ft. Duchesne on May 29-31, 1979; Rangely, Colorado on September 10, 1979; and Vernal, Utah on September 11, 1979. The meetings held in Rangely and Vernal were public meetings. The meeting held at Ft. Duchesne was for local, State and Federal agencies.

In addition to the formal scoping meetings, numerous contacts have been made with various agencies and individuals. Two additional public meetings on transmission line routing were held in Salt Lake City and Price, Utah in conjunction with the U.S. Forest Service on January 16 and 17, 1980, respectively.

The major issues identified centered around socioeconomic and air quality impacts, water availability in the White River, and effect on the Green River system.

CONSULTATION AND COORDINATION IN PREPARATION OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

An interagency review of the preliminary Draft EIS was held in Salt Lake City on May 21-23, 1980. This meeting was an opportunity for various Federal, State, and local governments to review the preliminary Draft EIS and provide their input into the Draft EIS and was attended by representatives from the following agencies:

Bureau of Land Management, USDI
Office of Surface Mining, USDI
National Park Service, USDI
Fish and Wildlife Service, USDI
Western Area Power Administration, USDI
Forest Service, USDA
Rural Electricification Administration, USDA
Environmental Protection Agency
Colorado Department of Natural Resources
Colorado Department of Health
Rio Blanco County Commission, Colorado
Town of Rangely, Colorado
Uintah Basin Association of Governments, Utah
Uintah County Commission, Utah
Uintah County Water Conservancy District, Utah

FEDERAL CONTACTS

The following are the contacts initiated and actions completed in preparation of the Draft EIS. Comments received from the agencies were considered in preparation of the Draft EIS.

Agency	Nature of Contact	Action Taken
U.S. Forest Service	Request staff and data assistance.	Provide one team member and data assistance.
Western Area Power Administration	Review transmission line alternative.	Verified cost estimates for transmission line alternatives.
U.S. Geological Survey	Request information on water yields of the Green and White Rivers; also information on subsidence.	Information provided. Verified coal supply projections; review mine plan.
U. S. Soil Conservation Service	Request information on soil surveys.	Information provided.
Water and Power Resources Service	Request information on the cumulative effects on water quality of all proposed projects in the Green River Basin.	Information provided.
Office of Surface Mining, Reclamation, and Enforcement	Request data assistance and discuss role of OSM in preparation of the EIS.	Assistance provided after completion of mine plan and EIS process.
Bureau of Indian Affairs	Request land use data for Uinta and Ouray Reservation.	Data provided.

STATE CONTACTS

Agencies of State government having jurisdictional interest or special expertise in the project, listed below, have been contacted and have supplied statement data.

Agency	Nature of Contact	Action Taken
Utah Department of Natural Resources, Division of Water Rights	Request information on water policy.	Information provided.

Utah Division of Water Resources	Request data on availability of water in the White River.	Information provided.
Utah Department of Transportation	Request information on traffic flow statistics.	Information provided.
Utah Division of Wildlife Resources	Discuss impacts of transmission lines on big game.	Provided information on wildlife habitat.
Utah State Historic Preservation Officer	Request consultation under the Natural Historic Preservation Act and 36 CFR 800; preparation of Memorandum of Understanding.	Memorandum signed.
Colorado Governor's Environmental Afairs Office	Request list of authorizing actions and permits required from the state.	List provided.
Colorado Highway Department	Request information on traffic flow statistics.	Information provided.
Colorado Health Department	Request information on water quality standards.	Information provided.
Colorado Division of Mines	Request list of permits required to open a mine.	List provided.
Colorado Division of Wildlife	Request information on wildlife.	Information provided.
Colorado Department of Natural Resources	Request assistance with and information on various portions of EIS.	Assistance and information provided.
Colorado State Historic Preservation Officer	Request consultation under the Natural Historic Preservation Act and 36 CFR 800.	Consultation initiated.
Wyoming State Historic Preservation Officer	Request consultation under the National Historic Preservation Act and 36 CFR 800; preparation of Memorandum of Understanding.	Memorandum signed.

LOCAL GOVERNMENT CONTACTS

The following public officials at the local level were advised of the project. Their views and comments were considered in preparation of the statement.

Agency	Nature of Contact	Action Taken
Carbon County, Utah	Request list of permits required.	List provided.
Davis County, Utah	Request list of permits required.	List provided.
Duchesne County, Utah	Request list of permits required.	List provided.
Juab County, Utah	Request list of permits required.	List provided.
Morgan County, Utah	Request list of permits required.	List provided.
Salt Lake County, Utah	Request list of permits required.	List provided.
Uintah County, Utah	Request zoning ordinance.	Zoning ordinance provided.
Utah County, Utah	Request list of permits required.	List provided.
Wasatch County, Utah	Request list of permits required.	List provided.
Weber County, Utah	Request list of permits required.	List provided.
Uintah Basin Association of Governments	Request information on oil shale development in Utah.	Information provided.
Vernal City Planner	Request Vernal Comprehensive Community Plan.	Plan provided.
Moffat County, Colo.	Request list of permits required; also information on zoning.	List and information provided.
Rio Blanco County, Colo.	Request list of permits required, also information on zoning.	List and information provided.
Rangely City Manager	Request Rangely Comprehensive Community Plan.	Plan provided.
Sweetwater County, Wyo.	Request list of permits required.	List provided.
Uinta County, Wyoming	Request list of permits required.	List provided.

COORDINATION IN REVIEW OF THE DEIS

The following list identifies those agencies, bureaus, and groups that will receive a copy of the Draft EIS and be requested to submit written comments:

FEDERAL AGENCIES

Advisory Council on Historic Preservation
Department of Agriculture
- Forest Service
- Soil Conservation Service

Department of Commerce
- National Oceanic and Atmospheric Administration

Department of Defense
Department of Energy
- Bonneville Power Administration
- Office of Energy Research
- Office of Environment
- Western Area Power Administration

Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of the Interior
- Bureau of Indian Affairs
- Bureau of Mines
- Fish and Wildlife Service
- Geological Survey
- Heritage Conservation and Recreation Service
- National Park Service
- Office of Surface Mining, Reclamation, and Enforcement
- Water and Power Resources Service

Department of Labor
- Mine Health and Safety Administration
- Occupational Safety and Health Administration

Department of Transportation
- Federal Aviation Administration
- Federal Highway Administration

Environmental Protection Agency
Interstate Commerce Commission

STATE AGENCIES AND ENTITIES

State of Utah
- Utah State Agencies Clearing House (A-95)

State of Colorado
- Governor's Clearing House

State of Wyoming
- Governor's Clearing House

LOCAL AGENCIES

County Commissioners:
- Carbon, Daggett, Davis, Duchesne, Juab, Morgan, Salt Lake, Sanpete, Summit, Uintah, Utah, Wasatch, Weber (Utah); Rio Blanco, Moffat (Colorado); Sweetwater, Uintah (Wyoming).

Uintah Basin Association of Governments (Utah)

Copies of the Draft EIS will also be submitted to those cities and towns interested in and affected by the project.

NON-GOVERNMENTAL ORGANIZATIONS

Archaeological Society of Utah
Canyon Country Coalition
Colorado Bar Association
Colorado Association of County Commissioners
Colorado Association of Commerce and Industry
Colorado Cattlemen's Association
Colorado Dude and Guest Ranch Association
Colorado Environmental Health Association
Colorado Farm Bureau
Colorado Federation of Women's Clubs
Colorado Federation of Garden Clubs
Colorado Four-Wheel Drive Association
Colorado Guides and Outfitters Association
Colorado Mining Association
Colorado Motorcycle Association
Colorado Mountain Club
Colorado Open Space Council
Colorado Parks and Recreation Society.
Colorado Petroleum Association
Colorado Plateau Environment Advisory Council
Colorado Ridgerunners
Colorado Rivers Council
Colorado Sportsmen's Association
Colorado Water Congress
Colorado White Water Association
Colorado Wildlife Association
Colorado Wildlife Federation
Colorado Wildlife Society
Colorado Wool Grower's Association
Common Cause
Conservancy Resource Center
Council of Utah Resources
Defenders of the Outdoor Heritage
Defenders of Wildlife
Desert Protective Council
Enchanted Wilderness Association
Environmental Awareness
Environmental Defense Fund, Rocky Mountain/Great Plains
Escalante Wilderness Committee
Friends of the Earth
Good Earth
Institute of Ecology
Izaak Walton League
ISSUE
League of Women Voters
Mearns Wildlife Society
Mineralogical Society of Utah
National Association of Conservation Districts
National Cattlemen's Association

National Council of Public Land Users
National Environmental Health Association
National Parks and Conservation Association
National Parks and Recreation Association
National Resources Defense Council, Inc.
National Wildlife Federation
Natural Resources Defense Council, Inc.
Nature Conservancy
Pro-Utah, Inc.
Rio Blanco Historical Society
Rocky Mountain Association of Geologists
Rocky Mountain Center on Environment
Rocky Mountain Federation of Mineralogical Societies
Rocky Mountain Motorcycles
Rocky Mountain Oil and Gas Association
Rocky Mountain Sportsmen Association
Save Our Canyons Committee
Sierra Club
Society for Range Management
Society of Conservation of Bighorn Sheep
Utah Audobon Society
Utah Cattlemen's Association
Utah CLEAR
Utah Environment Center
Utah Farm Bureau
Utah Geological and Mineral Survey
Utah Lung Association
Utah Mining Association
Utah Nature Study Society
Utah Sportsmen's Association
Utah Water User's Association
Utah Wildlife and Outdoor Recreation Federation
Utah Wool Growers Association
Wasatch Mountain Club
Western Rockhound Association
The Wilderness Society
Women's Conservation Council of Utah

PRIVATE COMPANIES AND UNIVERSITIES

Proponents of the Moon Lake Power Plant Project
Intermountain Consumer's Power Association
Western Fuels Association, Inc.
Utah Power and Light Company
Brigham Young University
University of Utah
University of Colorado
University of Wyoming

PUBLIC HEARINGS

Public hearings will be held at designated locations in Utah and Colorado to receive public comment on the adequacy of the Draft EIS. Times, dates, and locations for the hearings will be announced in the Federal Register and through press releases.

LIST OF PREPARERS

The EIS team was organized in January 1980, at the BLM District Office in Richfield, Utah. REA input was provided from Washington, D.C. The interdisciplinary team consisted of specialists in air quality, wildlife, fisheries, range, recreation, vegetation, soils, cultural resources, socioeconomics, and land use planning, and consisted of the following individuals:

TABLE 5-1

Team Organization

Name	Title	Assignment	Education	Experience
Don Pendleton	District Manager	Review and Approval	BS Wildlife	BLM - 25 years
Larry Oldroyd	Project Manager	Organization and Support	BS Animal Husbandry	BLM - 19 years Other - 11 years
Greg Thayn	Biologist	Team Leader Vegetation Animal Life	BS Zoology MS Botany PhD Botany-Geology-Ecology	BLM - 6 years
Thom Slater	Environmental Coordinator	Review	MS Landscape Architecture and Environmental Planning	BLM - 12 years
Craig Harmon	Archaeologist	Technical Coordinator Cultural Resources	BA Anthropology MA Anthropology	BLM - 3 years Other - 5 years
Roger Twitchell	Botanist	Vegetation, T&E Plants	BS Botany	BLM - 4 years
Bert Lowry	Wildlife Biologist	Animal Life, T&E Animals	BS Zoology	BLM - 13 years Other - 2 years
Dee Ritchie	Range Conservationist	Transmission System	BS Wildlife, Range, and Forest Management MS Pathology, Range Management	BLM - 1 year Other - 21 years
David Hillier	Economist	Socioeconomics	BA Economics	BLM - 4 years Other - 3 years
Ferris Clegg	Environmental Specialist	Aquatic and Terrestrial Biology	BS Biological Science MA Biological Science	BLM - 1 year Other - 16 years
Duane DePaepe	Environmental Specialist	Land Use, Land Use Plans and Controls	BA Geography MA Geography	BLM - 1 year Other - 11 years
Ed Bovy	Outdoor Recreation Planner	Recreation and Visual Resources	BA Geography MS Resource Geography	BLM - 2 years Other - 2 years
Wayne Kammerer	Outdoor Recreation Planner	Recreation and Visual Resources	BS Forestry MS Forestry EdM Human Services	BLM - 1 year Other - 2 years
Margaret Matthies	Outdoor Recreation Planner	Visual Resources	BS Outdoor Recreation	BLM - 5 years Other - 1 year
Mark Green	Air Quality Specialist	Air Quality	BS Atmospheric and and Oceanic Sciences MS Meteorology	BLM - 3 years
Lawrence R. Wolfe	Environmental Protection Specialist	REA-Related activities	BS Resource Management MS Natural Resources	REA - 2 1/2 years Other - 4 years
Garth Heaton	Forester	Forest Service Coordinator	BS Forestry	FS - 13 years
Mike Brown	Writer-Editor	Editorial	BA History	BLM - 1 year Other - 5 years
Elaine Torgerson	Writer-Editor	Editorial	AD Business	BLM - 3 years Other - 2 years
Shirley Taft	Clerical	Typing and Proofing		BLM - 5 years Other - 5 years

REFERENCE MATERIAL

United States
Environmental Protection
Agency

Region 8
Suite 103
1860 Lincoln St.
Denver, CO 80295

Colorado, Montana,
North Dakota,
South Dakota,
Utah, Wyoming

EPA

APPENDIX 1

JUL 21 1980

REF: 8AH-A

Mr. Gary J. Wicks
State Director
Bureau of Land Management
Utah State Office
136 E. South Temple
Salt Lake City, Utah 84111

Dear Gary:

In response to your request dated June 18, 1980, relative to the sulfur dioxide removal efficiency achievable by available technology, we have examined the data submitted by Burns and McDonnell, including the presentations and claims of potential suppliers. We conclude from this evidence that 95% efficiency is achievable by some of the systems described.

Available information and time does not permit us to evaluate the individual proposed Moon Lake sulfur dioxide control options. Four different control equipment vendors have bid and will guarantee the 95% control level of performance.

Sustained performance at 95% control efficiency is not well documented at present. This lack of documentation is explained primarily by the general absence of State or Federal performance standards requiring that degree of control, and by the lack of continuous emission monitoring data from existing plants with sulfur dioxide controls. While sustained 95% control has not been well documented and appears to be at the upper limit of existing control technology, we have no reason to conclude that it cannot be achieved.

Sincerely yours,

Roger L. Williams
Regional Administrator

APPENDIX 2

STATE OF UTAH

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RIGHTS

DEE C. HANSEN
STATE ENGINEER

EARL M. STAKER
DEPUTY

200 EMPIRE BUILDING
231 EAST 400 SOUTH
SALT LAKE CITY, UTAH 84111
(801) 533-6071

DIRECTING ENGINEERS
HAROLD D. DONALDSON
DONALD C. NORSETH
STANLEY GREEN
ROBERT L. MORGAN

July 3, 1980

Mr. J. Sterling Merrell
Community Impact Coordinator
Deseret Generation & Transmission
Co-operative
8722 South 300 West
Box BB
Sandy, Utah 84070

Dear Mr. Merrell:

Thank you for your letter of June 24, 1980, having reference to the Moon Lake Power Plant presently being considered for location in either eastern Utah near Bonanza, or near Rangely, Colorado.

In your letter you indicate that there is a possibility that a Utah water right presently held in the Green River would be transferred to Rangely, Colorado, if that were the desirable plant location. And finally in your last paragraph you ask if this type of transfer would be permitted by the State of Utah, or if the State would consider appropriating a portion of it's Colorado River entitlement to the Moon Lake Project for use in Colorado.

Please be advised that at present Utah law does not permit the filing of a change application which would move a Utah water right to an adjoining state for use in that state. Also in this regard, I would oppose any legislation which contemplated that type of authority.

The second phase of your question had to do with the possibility of the State Engineer appropriating water to the Moon Lake Project for uses in Colorado. As you are aware, there is a provision under Utah water law which permits the State Engineer to approve the appropriation of water within the State to be used in another state, if it can be demonstrated that such a use would be a benefit to the residents of the State of Utah, and if it could be done within the water entitlements of the State. I would be very

Mr. J. Sterling Merrell
July 3, 1980
Page 2

reluctant to approve a water filing of the nature which you describe, since both the coal mine and the plant would be located within the State of Colorado. The only possible benefit to the residents of the State of Utah would be the possibility of some eastern Utah residents driving into Colorado to work at the plant or the coal mine. The present policy in the State of Utah would not warrant the approval of such a water right.

If I can be of further assistance, please feel free to contact me at your convenience.

Yours truly,

Dee C. Hansen

Dee C. Hansen, P.E.
State Engineer

DCH:sp

cc: Governor Scott M. Matheson
Mr. Gordon E. Harmston

STATE OF UTAH

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RIGHTS

DEE C. HANSEN
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EARL M. STAKER
DEPUTY

200 EMPIRE BUILDING
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(801) 533-6071

DIRECTING ENGINEERS
HAROLD D. DONALDSON
DONALD C. NORSETH
STANLEY GREEN
ROBERT L. MORGAN

November 29, 1979

Bureau of Land Management
Richfield District Office
150 East 900 North
Richfield, Utah 84701

Attention: Mr. Ben Hamm

Gentlemen:

You recently requested a letter from this office stating the State Engineer's policy of allowing water to be pumped across state lines to be used in another state.

The existing laws of the State of Utah do allow the State Engineer to approve water filings for use in another state, provided that a public hearing is held to demonstrate to the citizens of the State of Utah that the use in another state would benefit them.

It should be pointed out that the State Engineer cannot prejudge a proposal to divert water out of the State of Utah when an application has not been filed to seek such approval.

Yours truly,

Dee C. Hansen

Dee C. Hansen, P.E.
State Engineer

DCH:sp

APPENDIX 3

Deseret Generation and Transmission - Major Authorizing Actions

This section is a summary of Federal, State, and local government actions that would be required to implement the project.

Federal Authorizing Actions

Project Feature	Nature of Action	Authority
	DEPARTMENT OF THE INTERIOR Bureau of Land Management[a]	
Generating Station and Support Facilities.	Transfer ownership.	Title II of Federal Land Policy and Management Act of 1976 (90 Stat. 2750, et seq.).
	or Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Power Transmission System (including access, field offices, and staging areas).	Grant rights-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Water Supply Pipeline.	Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Construction Materials for Plant Complex, Roads, etc.	Issue permit for borrow material.	Act of July 31, 1947 as amended (30 U.S.C. 601, 602; 43 CFR 3600).
Electric Railroad and Coal Delivery Conveyor.	Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Technical Site Investigations (other project components).	Issue special land-use permit.	43 CFR 2920.0-3.
Bonanza Plant Site Access Road.	Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).

(continued)

Project Feature	Nature of Action	Authority
Deserado Mine Portal.	Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Coal Slurry Pipeline.	Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Electric Coal Haul Railroad.	Grant right-of-way.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
Preference Right Lease Areas.	Issue lease.	Mineral Leasing Act of 1920 (30 U.S.C. 201 [6]).
	National Park Service	
Generating Station.	Review of Prevention of Significant Deterioration Permitting Recommendation by EPA.	Clean Air Act of 1977 as amended (43 U.S.C. 1701; 40 CFR 48.21).
	U.S. Geological Survey	
Deserado Mine.	Approve mining plan for existing and preference right lease areas and administer coal lease operation at mine portal. Approve surface facilities with coal lease in consultation with BLM.	Mineral Leasing Act of 1920 (30 U.S.C. 181; Secretarial Order No. 2948 of October 6, 1972).
	Office of Surface Mining	
Deserado Mine.	Review and certify the adequacy of the mining and reclamation plan. Issue mining permit.	Surface Mining Control and Reclamation Act, August 3, 1977.
	Water and Power Resources Service[a]	
Power Transmission System.	Grant rights-of-way where 345-kV system encroaches on existing water and power rights-of-way.	Reclamation Project Act of 1939, Section 10 (53 Stat. 1187).

(continued)

Project Feature	Nature of Action	Authority
	DEPARTMENT OF AGRICULTURE U.S. Forest Service (Ashley, Uinta, Wasatch, and Manti-LaSal National Forests)	
Power Transmission System (including access, field offices, and staging areas).	Grant Special Use Permit.	Title V of Federal Land Policy and Management Act of 1976 (90 Stat. 2776, et seq.).
	Rural Electrification Administration	
Moon Lake Power Plant Project.	Approval of loan guarantee for construction and operation of the proposed project.	Rural Electrification Act of 1936 (49 Stat. 1363; 7 U.S.C. Chap 31; 7 U.S.C. 901-950[6]).
	DEPARTMENT OF DEFENSE U.S. Army Corps of Engineers[a]	
Coal Mine Access Road Bridge and Heavy Haul Route Bridge Work.	Issue construction or Section 404 permit.	Clean Water Act of 1977 (86 Stat. 816, 884; 33 U.S.C. 1251, 1344 as amended).
	DEPARTMENT OF TRANSPORTATION Federal Aviation Administration	
Concrete stacks at plant site.	Issue air space permit. Provide airport-related air space determination and air space obstruction clearances for project facilities.	Federal Aviation Act of 1958, Public Law 850746, August 23, 1952 (72 Stat. 749, 797; 49 U.S.C 1347, 1501; 14 CFR 77).
	Environmental Protection Agency[a]	
Water Collection System.	Issue operating permits.	Clean Water Act of 1977 (86 Stat. 816, 884; 33 U.S.C. 1251, 1342; 40 CFR 130 as amended).
Solid Waste Disposal Area.	Review and approve pollution discharge control.	Clean Water Act of 1977 (86 Stat. 816, 884; 33 U.S.C. 1251, 1342; 40 CFR 130 as amended).

(continued)

Project Feature	Nature of Action	Authority
Generating Station.	Issue Prevention of Significant Deterioration Permit for generating station stack emissions.	Clean Air Act of 1977, as amended (43 U.S.C. 1701; 40 CFR 42.21).
	Approval of Spill Prevention Control and Countermeasure Plans.	Federal Water and Power Conservation Act (86 Stat. 868).

State Authorizing Actions

Project Feature	Nature of Action	Authority
	STATE OF UTAH	
	Division of State Lands	
Bonanza Plant Site (including access).	Grant right-of-way.	Utah Code Annotated (UCA) 1953 as amended, 65-2-1.
Water Supply Pipeline.	Grant right-of-way.	Utah Code Annotated (UCA) 1953 as amended, 65-2-1.
Electric Coal Haul Railroad.	Grant right-of-way.	Utah Code Annotated (UCA) 1953 as amended, 65-2-1.
Transmission System (including access, field offices, and staging areas).	Grant right-of-way.	Utah Code Annotated (UCA) 1953 as amended, 65-2-1.
	Department of Transportation	
Transmission System.	Issue encroachment permit for State and Federal highway crossings.	Utah Code Annotated (UCA) 1953 as amended, 27-9-9 through 11.
	Division of Health	
	Branch of Environmental Services	
Each project component related to pollution production and control.	Issue permit.	Utah Code Annotated (UCA) 1953 as amended, chapters 24 through 26.
Bonanza Plant Site.	Issue permit for domestic water.	Utah Code Annotated (UCA) 1953 as amended, 26-15-4.
Solid Waste Disposal Area.	Approve plans.	Utah Code Annotated (UCA) 1953 as amended, Title 26.
	Highway Patrol	
Bonanza Plant Site.	Issue overweight truck permits for delivery of materials to plant site.	Utah Code Annotated (UCA) 1953 as amended, 27-12-155.

(continued)

Project Feature	Nature of Action	Authority
	STATE OF COLORADO	
	Board of Land Commissioners[a]	
Rangely Plant Site (including access).	Issue right-of-way.	Colorado Revised Statutes 25-8-101.
Transmission System (including access, field offices, and staging areas).	Issue right-of-way.	Colorado Revised Statutes 25-8-101.
Water Supply Pipeline.	Issue right-of-way.	Colorado Revised Statutes 25-8-101.
Electric Coal-Haul Railroad.	Issue right-of-way.	Colorado Revised Statutes 25-8-101.
	Department of Health[a]	
Each project component related to pollution production and control.	Issue the following permits:	
	Air pollution	Colorado Revised Statutes 25-7-101, 1970.
	Water discharge	Colorado Revised Statutes 25-8-501, 1973.
	Solid waste	Colorado Revised Statutes 30-2-103 and 104, 1973.
	Sewage disposal	Colorado Revised Statutes 20-10-104, 1973.
	Domestic water Supply.	Colorado Revised Statutes 25-1-107.
	Division of Mines	
Deserado Mine.	Issue coal mine license.	Colorado Revised Statutes 1953, Title 34 Article 23, Section 101.
	Issue diesel permit for underground operation of equipment.	Bulletin 20, Colorado Division of Mines.
	Issue explosives license.	Colorado Revised Statutes 1973, Title 34, Article 27, Section 101-110.

(continued)

Project Feature	Nature of Action	Authority
	Division of Mined Land Reclamation	
Deserado Mine.	Issue extraction permit.	Colorado Revised Statutes 1973, Title 24.
	Division of Water Resources[a]	
Wells along White River.	Issue construction permit.	Colorado Revised Statutes 37-90-137.
	Department of Highways[a]	
Transmission System.	Issue utility crossing permits for State and Federal crossings.	Colorado Revised Statutes 38-5-101.
Rangely Plant Site.	Issue overweight truck permits for delivery of materials to plant site.	Colorado Revised Statutes 42-4-409.
	STATE OF WYOMING Public Lands Administration Commissioner of Public Lands	
Transmission System.	Issue right-of-way.	Wyoming Statutes 1957, Section 36-20.
	Highway Department	
Transmission System.	Issue highway crossing license for State and Federal highway crossings.	Wyoming Statutes 1945 Paragraph 3-6201.

Local Authorizing Actions

Project Feature	Nature of Action	Authority
	UTAH	
	Carbon County	
Transmission System.	Issue building permit.	Zoning ordinance for Carbon County adopted 5/19/59 as amended--Article 5, Ordinance 130.
	Morgan County	
Transmission System.	Issue conditional use permit.	Zoning ordinance for Morgan County.
	Davis County	
Transmission System.	Issue special use permit.	Zoning ordinance for Davis County, 1953 (revised 1963).
	Salt Lake County	
Transmission System.	Issue conditional use permit.	Zoning ordinance for Salt Lake County, Oct. 6, 1966.
	Uintah County	
Moon Lake Power Plant Project.	Issue conditional use permit.	Zoning ordinance of Uintah County, November, 1971.
	Issue building permit.	Zoning ordinance of Uintah County, November, 1971.
Borrow Areas.	Issue extraction of earthproducts permit.	Zoning ordinance of Uintah County, November, 1971.
	Utah County	
Transmission System.	Issue conditional use permit.	1976 revised zoning ordinance of Utah County.
	COLORADO	
	Rio Blanco County[a]	
All project components.	Issue special use permit.	Rio Blanco County zoning ordinance, Section 305a.
	Issue building permits.	Rio Blanco County Uniform Building Code.

(continued)

APPENDIX 3, Local Authorizing Actions (concluded)

Project Feature	Nature of Action	Authority
	Impact Analysis Statement.	Rio Blanco County Impact Regulations, Paragraphs 1001-1013.
Transmission System.	Issue conditional use permits.	Rio Blanco County Zoning Ordinance, Section 305.
Coal Haul Conveyor.	Issue conditional use permit.	Rio Blanco County Zoning Ordinance, Section 305.
	Moffat County	
Transmission System and Electric Coal Haul Railroad.	Issue conditional use permit.	Moffat County Zoning Regulations.
	WYOMING Sweetwater County	
Transmission System.	Issue temporary use permits for construction camps and easements across county roads.	Sweetwater County Zoning Resolution of 1979.

[a]The impacts and construction of the Rangely Reservoir project will be studied in a separate report as required by National Environment Policy Act.

APPENDIX 4

The Public Service Commission Order

Background of the PSC Order

The Public Service Commission of Utah (PSC) issued a Stipulation and Order in June 1979 which has the result of cancelling all resale power contracts between UP&L and other entities. The PSC's Stipulation and Order is a result of an action initiated by several consumer groups who charged that the retail consumer supported the wholesale rate of electrical power contracted for in UP&L's resale contracts with other electrical distribution entities. The consumer groups advocated that inequities existed because not all consumers were sharing equally in the costs associated with the construction and work in progress in UP&L's newer units, and therefore the retail consumer was being unduly charged to support such new construction activities.

PSC's Stipulation and Order Requirements

The PSC's Stipulation and Order requires five specific actions, three of which directly affect Deseret and its member distribution cooperatives. Item two of the Order requires that UP&L present to the PSC executed contracts between UP&L, Bountiful, Provo, and ICPA (as agent) evidencing the sale of a portion of UP&L's generating units to the above parties for their firm power requirements until UP&L's next generating units are scheduled for commercial operation or until the above parties' next generating units are scheduled for commercial operation.

Item 3 requires an agreement be submitted to the PSC which cancels all existing resale contracts between the above parties in lieu of capacity sales. Item 4 requires that UP&L refrain from further contracts of firm power for any resale customer not then presently served.

Impact of PSC's Stipulation and Order

The immediate impact to Deseret of the PSC's action is that Deseret's unit must be in commercial operation by March of 1985. The March deadline was established through negotiations with UP&L and anticipated authorization by the PSC after an initial deadline of July 1984.

If Deseret is unable to complete its proposed generating unit for commercial operation by the March 1985 deadline, the cost to Deseret to purchase power from UP&L would increase by 20 to 40 percent dependent upon the amount purchased.

Due to Deseret's increasing load demand, the power available to Deseret from Hunter 2 will be consumed by Deseret's projected load prior to the commercial operation of the Moon Lake project. Therefore, the additional power which has been contracted for with UP&L must be available until the March 1985 deadline to insure Deseret's ability to satisfy its load requirements.

Deseret has been notified by UP&L that additional generating capacity through participation in Hunter 3 or 4 is not available as the capacity is totally allocated to UP&L's load requirement. The participation alternative is the only alternative available to Deseret in that the PSC's Order prevents UP&L from further resale power contracts.

Without the Moon Lake project, Deseret will be required to enter the spot market to satisfy their load requirements. The availability of spot-market

purchases is highly questionable due to the power deficits in the general area and the demand by California utilities. Further, the cost associated with spot-market power purchases would be extremely prohibitive to Deseret's consumers. Depending on the time of year, the price for day-to-day power purchases could range from 50 to 100 mills (1980 dollars). This represents approximately a 100- to 300-percent increase in the cost of power.

To provide economic and reliable service, Deseret will require alternative and additional generation sources.

APPENDIX 5

Transmission System Routing Alternatives

TABLE A

Transmission System Alternative Segments

Segment Number[a]	From	To	Length (miles)
1	Bonanza	Little Bonanza	6.2
2	Little Bonanza	Rangely substation	17.5
3	Bonanza	Mellen Hill	16.0
4	Mellen Hill	Rangely substation	9.7
5	Bonanza	Deadman Bench	4.2
6	Deadman Bench	Stirrup	15.0
7	Stirrup	Upalco	31.0
8	Upalco	Arcadia	4.0
9	Arcadia	Sinkdraw	22.5
10	Sinkdraw	Fruitland	15.0
11	Fruitland	Tank Hollow	30.0
12	Bonanza	Coyote Wash	3.5
13	Coyote Wash	Castle Peak	39.0
14	Castle Peak	South Myton	3.2
15	South Myton	Sink Draw	28.5
16	South Myton	Upalco	12.5
17	Arcadia	Sowers Canyon	12.5
18	Castle Peak	Sowers Canyon	16.5
19	Sowers Canyon	Tank Hollow	65.0
20	Tank Hollow	Thistle	8.8
21	Thistle	Spanish Fork substation	7.5
22	Spanish Fork substation	Mona substation	24.8
23	Thistle	Mud Flat	15.5
24	Mud Flat	Mona substation	25.8
25	Tank Hollow	Mud Flat	23.8
26	Rangely	Red Wash	41.0
27	Red Wash	Stirrup	8.9
28	Rangey	Rangely substation	15.5
29	Little Bonanza	Coyote Wash	8.9
30	Fruitland	Mountain Green	92.9
31	Mountain Green	Ben Lomond	24.0
32	Deadman Bench	Red Wash	8.0
33	Red Wash	Asphalt Ridge	9.0
34	Asphalt Ridge	Vernal substation	4.3
35	Asphalt Ridge	Mountain Green (via Lone Tree)	160.7
36	Mona substation	Ben Lomond	113.7
37	Price Canyon	Water Hollow (via Eccles Canyon)	39.5

[a]Segment numbers correlate with the pocket map located in the back of the book.

(continued)

TABLE B

Unit 1 Combined 138- 345-kV Transmission System-
Approximate Length and Ownership of Alternative Routes
Bonanza Site to Tank Hollow and Eccles Canyon Alternative

Alternative	Length						Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
	Total	By Ownership[a] Private	State	BLM	USFS	Indian				
Via Upalco-Fruitland[c] (Segments 5,6,7)	50.2 mi. Double Circuit 138- 345-kV Line	16.0	1.0	26.2	--	7.0	--	25.0	1,034.0	4.5
(Segments 8,9,10, 11)	71.5 mi. of Single Circuit 345-kV Line	50.5	1.0	--	14.5	5.5	41.5	22.0	1,302.0	3.5
TOTAL	121.7	66.5	2.0	26.2	14.5	12.5	41.5	47.0	2,336.0	8.0
Via Castle Peak-Sowers Canyon (Segments 12,13)	42.5 mi. Double Circuit 138- 345-kV Line	2.25	4.5	19.75	--	16.0	--	15.0	876.0	2.3
(Segments 14,16)	15.7 mi. Single Circuit 138-kV Line	11.5	--	3.2	--	1.0	--	2.0	191.0	0.3
(Segments 18,19)	81.5 mi. Single Circuit 345-kV Line	41.25	7.35	6.5	20.0	6.5	38.0	90.0	1,484.0	1.8
TOTAL	139.7	55	11.85	29.45	20.0	23.5	38.0	107.0	2,551.0	4.4
Via Upalco-Sowers Canyon (Segments 5,6,7)	50.2 mi. Double Circuit 138- 345-kV Line	16.0	1.0	26.2	--	7.0	--	25.0	1,034.0	4.5
(Segments 8,17,19)	81.5 mi. Single Circuit 345-kV Line	47.25	4.7	1.5	20.0	8.0	54.5	90.0	1,484.0	1.7
TOTAL	131.7	63.25	5.7	27.7	20.0	15.0	54.5	115.0	2,528.0	6.2
Via Castle Peak-Fruitland (Segments 12,13,14)	45.7 mi. Double Circuit 138- 345-kV Line	2.25	4.5	22.95	--	16.0	--	6.0	942.0	2.3

(continued)

APPENDIX 5, TABLE B (concluded)

Alternative	Length: Total	Length By Ownership[a]: Private	State	BLM	USFS	Indian	Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
Via Castle Peak-Fruitland (cont.) (Segment 16)	12.5 mi. Single Circuit 138-kV Line	11.5	--	--	--	1.0	--	1.0	152.0	0.3
(Segments 10,11,15)	73.5 mi. Single Circuit 345-kV Line	52.0	1.0	--	14.5	6.0	15.0	22.0	1,339.0	3.6
TOTAL	131.7	65.75	5.5	22.95	14.5	23.0	15.0	29.0	2,433.0	6.2
<u>Eccles Canyon and Comparable Alternatives</u>										
Price River-Water Hollow										
Via Eccles Canyon (Segment 37)	39.5 mi. Single Circuit 345-kV Line	28.0	--	1.5	10.0	--	--	4.0	719.0	1.0
Via Sowers Canyon/ Dairy Fork (Segment 19 [mile-posts 40-65]) (Segment 24 [mile-posts 0-6]) (Segment 25)	54.5 mi. Single Circuit 345-kV Line	48.0	1.0	--	13.5	--	8.0	5.0	949.0	5.0
Via Sowers Canyon/ Thistle Canyon (Segment 19 [mile-posts 40-65]) (Segment 20,23 Segment 24 [mile-post 0-6])	55.0 Single Circuit 345-kV Line	44.7	1.0	--	9.3	--	8.0	5.5	1,001.1	5.0

[a]Ownerships are estimated from approximate centerline of a 1-mile corridor and are subject to change depending on the placement of the towers.

[b]Includes the occupied acres.

[c]Applicant-proposed route.

(continued)

TABLE C

Unit 1 Bonanza Site 138-kV Transmission
System Alternatives
Bonanza

Alternative	Length	By Ownership[a]					Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
	Total	Private	State	BLM	USFS	Indian				
Bonanza to Vernal[c] (Segments 5,32,33, 34)	25.5 mi. Single Circuit 138-kV Line	4.8	5.0	15.7	--	--	21.3	2.0	310.0	0.2
Bonanza to Rangely Via Little Bonanza[c] (Segments 1,2)	23.7 mi. Single Circuit 138-kV Line	3.5	1.0	19.2	--	--	17.5	2.0	288.0	0.4
Via Mellen Hill (Segments 3,4)	25.7 mi. Single Circuit 138-kV Line	7.7	--	18.0	--	--	8.0	5.0	312.0	0.9

[a]Ownerships are estimated from approximate centerline of a 1-mile corridor and are subject to change depending on the placement of the towers.

[b]Includes the occupied acres.

[c]Applicant-proposed route.

(continued)

TABLE D

Bonanza Site Unit 2 345-kV Transmission System Alternatives
Bonanza Site to Ben Lomond Substation

Alternative	Length By Ownership[a] Total	Private	State	BLM	USFS	Indian	Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
Bonanza Site to Mountain Green										
Via Lone Tree[c] (Segments 5,32,33, 35)	181.9 mi. Single Circuit 345-kV Line	89.8	17.5	42.9	32.5	--	30.0	60.0	3,275.0	9.9
TOTAL	181.9	89.8	17.5	42.9	32.5	--	30.0	60.0	3,275.0	9.9
Bonanza Site to Mountain Green										
Via Upalco-Fruitland										
(Segments 5,6,7)	50.2 mi. Single Circuit 138-kV Line	16.0	1.0	26.2	--	7.0	--	1.0	609.0	--
(Segments 8,9,10, 30)	134.4 mi. Single Circuit 345-kV Line	123.4	--	--	5.5	5.5	66.5	59.0	2,447.0	10.5
TOTAL	184.6	139.4	1.0	26.2	5.5	12.5	66.5	60.0	3,056.0	10.5
Bonanza Site to Mountain Green										
Via Castle Peak-Fruitland										
(Segments 12,13,14)	45.7 mi. Single Circuit 138-kV Line	2.3	4.5	22.0	--	16.0	--	1.0	554.0	--
(Segments 15,10, 30)	136.4 mi. Single Circuit 345-kV Line	124.9	--	--	5.5	6.0	42.5	87.0	2,483.0	18.5
TOTAL	182.1	127.25	4.5	22.0	5.5	22.0	40.0	88.0	3,037.0	18.5
Mt. Green to Ben Lomond[c] (Segment 31)	24.0 mi. Single Circuit 345-kV Line	24.0	--	--	--	--	24.0	3.0	437.0	--
Mona to Ben Lomond (Segment 36)	113.7 mi. Single Circuit 345-kV Line	105.7	--	5.5	--	2.5	113.7	11.0	2,070.0	--

[a]Ownerships are estimated from approximate centerline of a 1-mile corridor and are subject to change depending on the placement of towers.

[b]Includes the occupied acres.

[c]Applicant-proposed route.

(concluded)

TABLE E

Unit 1 Combined 138- 345-kV Transmission System-
Approximate Length and Ownership of Alternative Routes
Rangely Site to Tank Hollow

Alternative	Length Total	Length By Ownership[a] Private	State	BLM	USFS	Indian	Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
Via Upalco-Fruitland[c] (Segments 26,27,7)	72.0 mi. Double Circuit 138- 345-kV Line	23.5	4.0	37.5	--	7.0	25.0	42.0	1,484.0	8.5
(Segments 8,9,10, 11)	71.5 mi. of Single Circuit 345-kV Line	50.5	1.0	--	14.5	5.5	41.5	22.0	1,302.0	3.5
TOTAL	143.5	74.0	5.0	37.5	14.5	12.5	66.5	64.0	2,786.0	12.0
Via Castle Peak-Sowers Canyon (Segments 28,2,29, 13)	79.5 mi. Double Circuit 138- 345-kV Line	8.0	6.5	49.0	--	16.0	31.5	25	1,637.0	3.6
(Segments 14,16)	15.7 mi. Single Circuit 138-kV Line	11.5	--	3.2	--	1.0	--	2.0	191.0	0.3
(Segments 18,19)	81.5 mi. Single Circuit 345-kV Line	41.25	7.25	6.5	20.0	6.5	38.0	90.0	1,484.0	1.8
TOTAL	176.7	60.75	13.75	58.7	20.0	23.5	69.5	117.0	3,312.0	5.7
Via Upalco-Sowers Canyon (Segments 26,27,7)	72.0 mi. Double Circuit 138- 345-kV Line	23.5	4.0	37.5	--	7.0	25.0	42.0	1,484.0	8.5
(Segments 8,17,19)	81.5 mi. Single Circuit 345-kV Line	47.25	4.75	1.5	20.0	8.0	54.5	90.0	1,484.0	1.7
TOTAL	153.5	70.75	8.75	39.0	20.0	15.0	79.5	132.0	2,968.0	10.2
Via Castle Peak-Fruitland (Segments 28,2,29, 13,14)	82.7 mi. Double Circuit 138- 345-kV Line	8.0	6.5	52.2	--	16.0	31.5	16.0	1,705.0	3.6
Via Castle Peak-Fruitland (cont.) (Segment 16)	12.5 mi. Single Circuit 138-kV Line	11.5	--	--	--	1.0	--	1.0	152.0	0.3
(Segments 15,10,11)	73.5 mi. Single Circuit 345-kV Line	52.0	1.0	--	14.5	6.0	15.0	22.0	1,338.0	3.6
TOTAL LENGTH	168.7	71.50	7.5	52.2	14.5	23.0	46.5	39.0	3,195.0	7.5

[a]Ownership is estimated from approximate centerline of a 1-mile wide corridor and is subject to change depending on the placement of the towers.

[b]Includes the occupied acres.

[c]Applicant-preferred route.

(continued)

APPENDIX 5 (continued)

TABLE F

Rangely Site Unit 1 138-kV Transmission System Alternatives

Alternative	Length: Total	By Ownership[a]: Private	State	BLM	USFS	Indian	Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
Rangely Site to Vernal Substation[c] (Segments 26,33,34)	54.3 mi. Single Circuit 138-kV Line	12.8	7.5	34.0	--	--	38.3	22.0	659.0	4.9
Rangely Site to Southwest Rangely Substation[c] (Segment 28)	15.5 mi. Single Circuit 138-kV Line	2.0	--	13.5	--	--	14.0	5.0	188.0	0.9

[a]Ownerships are estimated from approximate centerline of a 1-mile corridor and are subject to change depending on the placement of towers.

[b]Includes the occupied acres.

[c]Applicant-preferred route.

(continued)

APPENDIX 5 (continued)

TABLE G

Rangely Site Unit 2 - 345-kV
Transmission System Alternatives

Alternative	Length Total	By Ownership[a] Private	State	BLM	USFS	Indian	Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
Rangely Site to Mountain Green										
Via Lone Tree (Segment 26)	41.0 mi. Single Circuit 138-kV Line	7.5	3.0	30.5	--	--	25.0	5.0	747.0	--
(Segments 33,35)	169.7 mi. Single Circuit 345-kV Line	89.8	17.5	30.7	32.5	--	22.0	59.0	3,126.0	9.8
TOTAL	210.7	97.3	20.5	61.2	32.5	--	47.0	64.0	3,873.0	9.8
Via Upalco-Fruitland (Segments 7,26,27)	80.9 mi. per 138 kV Line (345-kV Double Circuit with Unit 1 to Upalco)	23.5	6.0	44.4	--	7.0	25.0	1.0	981.0	--
(Segments 8,9,10, 30)	134.4 mi. Single Circuit 345-kV Line	123.4	--	--	5.5	5.5	66.5	58.0	2,447.0	10.5
TOTAL	215.3	146.9	6.0	44.4	5.5	12.5	91.5	59.0	3,428.0	10.5
Via Castle Peak-Fruitland (Segments 28,29,2, 13,14)	82.7 mi. Single Circuit 138-kV Line	8.0	6.5	52.2	--	16.0	31.5	1.0	1,514.0	--
(Segments 15,10, 30)	136.4 mi. Single Circuit 345-kV Line	124.9	--	--	5.5	6.0	40.0	87.0	2,483.0	18.5
TOTAL	219.1	132.9	6.5	52.2	5.5	22.0	71.5	88.0	3,997.0	18.5
Mountain Green to Ben Lomond (Segment 31)	24.0 mi. Single Circuit 345-kV Line	24.0	--	--	--	--	24.0	3.0	437.0	--
Mona to Ben Lomond (Segment 36)	113.7 mi. Single Circuit 345-kV Line	105.7	--	5.5	--	2.5	113.7	11.0	2,070.7	--

[a]Ownerships are estimated from approximate centerline of a 1-mile corridor and are subject to change depending on the placement of towers.

[b]Includes the occupied acres.

[c]Applicant-preferred route.

(continued)

TABLE H

Unit 1 - 345-kV Transmission System Alternatives-
Tank Hollow to Mona Substation

Alternative	Length: Total	By Ownership[a]: Private	State	BLM	USFS	Indian	Miles in Existing Transmission Corridor	Acres Occupied (Includes Towers and Access)	Acres Disturbed[b]	Miles Permanent Access Road
Tank Hollow to Mona Via Dairy Fork[c] (Segments 25,24)	49.6 mi. Single Circuit 345-kV Line	33.7	0.6	2.0	13.3	--	19.7	28.7	903.0	5.6
Via Thistle Canyon (Segments 20,23,24)	50.1 mi. Single Circuit 345-kV Line	43.0	0.6	2.0	4.5	--	27.9	15.0	912.0	2.2
Via Utah Valley (Segments 20,21,22)	41.1 mi. Single Circuit 345-kV Line	30.8	--	5.0	5.3	--	15.7	23.0	749.0	4.1

[a]Ownerships are estimated from approximate centerline of a 1-mile corridor and are subject to change depending on the placement of the towers.

[b]Includes the occupied acres.

[c]Applicant-proposed route.

APPENDIX 6

Transmission System Reliability

In April 1962, representatives of interconnected electric utilities throughout the United States and eastern Canada met and formed the North American Power Systems Interconnection Committee (NAPSIC). One of the principal goals of NAPSIC was to coordinate operating criteria for interconnected utility operation. To accomplish this, NAPSIC publishes and revises periodically an operating manual which includes guides for system operation as well as an article entitled "Minimum Criteria for Operating Reliability." Section II of this article, in its present form, states in part, "The bulk power systems will be operated at all times so that instability, uncontrolled separation, or cascading outages (the uncontrolled successive loss of system elements) will not occur as a result of the most severe single contingency."

On November 9 and 10, 1965, a power system disturbance occurred which dramatically changed the electric utility industry's outlook on power system reliability. "On November 9, 1965, major sections of the Northeast were blacked out by a massive power failure that started in Canada and spread in cascade fashion to interconnected American systems as far south as New Jersey... This power failure served to bring system reliability questions into much sharper focus than had previously been the case. Moreover, it taught a valuable lesson, which is that an industry responsible for so basic a service as supplying electricity must guard against even highly unlikely eventualities." The above statement is a quotation from the Federal Power Commission's (FPC) "Guidelines for the Growth of the Electric Power Industry." The statement serves to indicate the degree of national concern for the reliable operation of electric power systems.

Following the 1965 "Northeast Blackouts" the FPC established an advisory committee to investigate this sytem disturbance and to report to the FPC on their findings. This resulted in a three-volume report on the investigatory studies and engineering appraisals entitled "Prevention of Power Failures" published in July of 1967 by the FPC. Volume 1 is a report to the President by the FPC, Volume 2 is a report to the FPC by the Advisory Committee, and Volume 3 contains the details of the studies of the Advisory Committee on the Northeast power failure. Volume 2 of the "Prevention of Power Failures" states the following in considering the concentration of transmission system capacity: "Notwithstanding the increased difficulty of securing transmission line rights-of-way, recognition should be given to the need for constructing lines on separate rights-of-way to assure the maximum possible reliability. Maximum reliability can only be obtained by avoiding excessive concentration of transmission capacity on a given right-of-way with the attendant greater risk of curtailment of system capability in the event of the force loss of all such capacity."

Also as a result of the "Northeast Blackout," the electric utility industry, beginning in 1967, established a number of regional electric reliability councils, and in 1969 formed a National Electric Reliability Council (NERC) to encourage the improvement of coordination of electric systems at both the regional and national levels. At the end of 1970 nine regional councils had been formed and they included virtually all major electric utilities in the country. There are nine electric reliability councils encompassing the United States and Canada.

The Reliability council which encompasses the service area of the Deseret Generation and Transmission Cooperative is the Western System Coordinating

Council (WSCC). Also included in the WSCC are all or portions of 13 states and one Canadian province. The WSCC publishes and periodically updates reliability criteria that is recommended for use in the design of member systems. This criteria states that the primary objective of the WSCC reliability criteria is continuity of service to loads. The criteria is based on the understanding that there should be no loss of load on a system for single-contingency disturbances. The criteria recommends that the outage of all transmission circuits on any one common right-of-way should be studied as a single-contingency condition. The criteria further states that cascading is unacceptable even under the most adverse credible disturbance.

Deseret Generation and Transmission Cooperative's Moon Lake project is proposed to consist of two 400-MW generating units. Two 345-kV transmission lines for delivery of the bulk power of these two units into the bulk transmission grid and three 138-kV transmission lines for distributing the plant output to the local area loads are proposed to be constructed.

There are several conditions, any of which could cause the outage of transmission lines of this nature in the Deseret service area of northeastern Utah. These conditions include lightning, sabotage or vandalism, collision of a vehicle with a transmission line structure, snowslides and/or landslides that may damage a structure, collision of aircraft with the transmission lines, and other natural and man-made phenomena. Because of the extremely high altitude, rough terrain, remote location, and the possibility of severe weather conditions, the replacement or repair of the transmission lines would be exceedingly difficult and extend the time required to restore even minimum acceptable service to consumers.

Although it is difficult to evaluate the probability of a specific outage on a transmission line, especially one due to vandalism, snowslides or landslides, or vehicular collisions, lightning activity is somewhat the more predictable of the above-listed conditions. The northeastern area of Utah (according to the thunderstorm/lightning maps of the United States prepared by the National Weather Service) lies within an area that receives three to four times the lightning activity found along the West Coast and two to three times the lightning activity found in Nevada and parts of eastern Utah. Lightning activity can cause the contingent loss of transmission lines.

Occasionally electric utilities will design double-circuit (two lines on the same transmission tower structure) as a part of their extra high voltage (EHV) transmission systems. However, this practice is not generally followed especially when these lines are the sole EHV lines existing from a multi-unit power plant facility. Were any of the above-mentioned events to occur on the Moon Lake project, with both units transmitting power over a double circuit transmission facility, it is highly probable that any of these conditions could cause the outage of both EHV circuits. With the loss of this amount of transmission capacity, it is certain that one of the 400-MW units of the Moon Lake project would have to be removed from service since the remaining 138-kV transmission system could not absorb the entire output of both units. The removal of this unit would probably be automatic when the generator protective equipment sensed the loss of stability created by the system shock of losing such a large percentage of the transmission capability. The loss of one, or possibly both of the units, would create a cascading effect resulting from the loss of two EHV transmission circuits. This would then leave the northeastern portion of Utah without its own generation and entirely dependent upon generating capability of adjacent areas. In addition, the Moon Lake area would be

tied to adjacent areas at only three points: Upalco, Vernal, and Rangely. In later years, as the loads of the northeastern Utah area continue to grow, these three transmission ties will not be sufficient to support the loads in the area and further cascading would be probable with the final result being a blackout of northeastern Utah. If such a blackout were to occur, the length of the outage would be dependent upon several factors including the restoration of power supply to the generating station for start-up purposes, as well as the magnitude of damage to the transmission system. If the damage to the transmission system involved the loss of transmission lines supporting structures, the plant might have to operate at a very low output and provide service to only the area loads until the EHV system could be restored.

A loss of the two 400-MW units at the Moon Lake project would also be a serious impact on the WSCC regional area. Although there should be sufficient operating reserves on a short-term basis to withstand such an outage, the makeup of this loss in generating ability would possibly be offset through the use of expensive oil-fired generation with the resulting impact being felt by the public in higher cost of this replacement power.

APPENDIX 7

Alternative Methods of Power Generation

Mid-Term Alternative Methods of Power Generation 1983-1990

Steam Generation With Eastern Coal, Municipal Waste or Wood

Use of Eastern coal as a fuel source for the Moon Lake project is not a viable alternative. The costs associated with transporting the fuel would be prohibitive, with no environmental benefits gained.

Municipal waste is being burned in coal-fired boilers at a number of power plants around the country. These systems may require up to 2,000 tons per day of refuse and the waste from all the cities around either alternative Moon Lake plant site would not be sufficient to operate the proposed plant at full load. The cost to administer and run a waste collection and transport system large enough to power the proposed units or provide a supplemental fuel source would be prohibitively expensive because sufficient quantities of waste are not available locally.

Wood or woodchips could probably not be used as fuel by Deseret. To fuel a power plant with a 400-MW capacity, wood harvesting would have to approach 440 million cubic feet per year. This amount of wood is not practicably harvestable in the Moon Lake service area.

Nuclear Plant

REA considered the installation of a nuclear facility since these plants are well suited for the continuous baseload operations which Deseret needs in the mid-1980s. Licensing procedures and related delays have resulted in lead times for installation which could be up to 10 to 12 years; therefore, installation could not be achieved until the late 1980s, well after the first Moon Lake unit is needed.

Hydroelectric

Large scale hydroelectric power is greatly limited by the availability of good sites. Few good sites remain in the United States and no hydroelectric developments of sufficient capacity to meet Deseret's projected loads are planned in the three states of Utah, Colorado, and Wyoming. Deseret is a preferred customer of the Western Area Power Administration (WAPA). WAPA markets the hydroelectric power generated by the Water and Power Resources Service. The hydropower now being developed by Water and Power Resources Service is nearly all peaking power and would not supply Deseret's required baseload generation (WAPA, 1980b). Consequently, hydroelectric power was not considered a viable method of power generation for Deseret.

Long-Term Alternative Methods of Power Generation 1991-1995

Geothermal

Geothermal power generation utilizes the heat of the earth for steam production. Several subsurface hot water reservoirs exist in western Colorado. None are of sufficiently high temperature to be applicable for the large scale generation of electrical power.

A possible commercial geothermal field is currently being developed at the Roosevelt Hot Springs unit near Milford, Utah. According to estimates made by the Phillips Petroleum Company and the University of Utah Department of Geology and Geophysical Sciences, this geothermal field might contribute a total of 300-MW. The first 52-MW power plant could be built by June 1982. Subsequent growth would be determined by the development of the steam field and would probably allow additional 52-MW units to be added in 2-year increments until the 300-MW capacity were reached.

Such a geothermal development could not replace the proposed Moon Lake project because (1) the full 300-MW capacity of the field could not be developed in time to meet Deseret's short-term load requirements; and (2) the development is not of sufficient capacity to meet Deseret's long-term demand.

Solar

The application of a commercial solar power plant to meet baseload energy requirements is still in the development stages. The United States Department of Energy (DOE) has devised a program plan and schedule aimed at the eventual commercialization of solar power plants. This program began in 1975, and the first commercial demonstration plant is scheduled for 1985. Solar plants for large scale application would not be sufficiently tested and developed in time for Deseret to consider a solar plant as a viable alternative for meeting its mid-1980's baseload power demands.

Wind

The intermittent nature of the wind and the wide geographical and season variations in the availability of this energy source require either supplementary energy storage capabilities or interties of wind energy conversion systems with conventional energy systems. The variable nature of both of these sources of energy would be detrimental in supplying capacity needs of Deseret. Also, the size of wind generation systems is still on a small scale and could not feasibly substitute for the total capacity needed.

Gasifier Boiler Generation

Various coal gasification processes are under development.

An Electric Power Research Institute (EPRI) assessment concluded that an advanced gasifier may become commercially available in 1984, and that first commercial service might occur in 1989. However, for baseload generation, it is more energy efficient to burn coal directly than to convert the coal through a gasification process prior to its combustion.

Fuel Cell Generation

Fuel cells convert chemical energy of high cost hydrogen-rich fuel into direct current electricity. The direct current is then converted to alternating current for utility power supply.

Fuel cells have been and are being tested for small scale generation projects. However, the technology has not been tested on the large scale required by Deseret, and thus is not considered to be a reliable and viable power source for Deseret's needs.

Fluidized Bed Combustion Steam Generation

Fluidized bed combustion (FBC) refers to the use of a bed of granular particles through which air or gas is passed causing the particles to float, and into which crushed coal is injected and burned. Potential advantages of fluidized bed combustion may include lower sulfur oxides and nitrogen emissions and more favorable economics and operating characteristics than a conventional coal-fueled boiler with flue gas desulfurization.

DOE is funding research on two different FBC designs, an atmospheric bed and a pressurized bed. These systems are not expected to be commercially available and tested prior to the mid-1980s, and thus are not being considered for Deseret's present power needs.

Solvent-Refined Coal Fueled Steam Generation

Solvent-refined coal (SRC) is a fuel which has been produced recently in pilot plants. SRC is a mixture of pulverized coal and a solvent to which hydrogen is added. The mixture is dissolved, filtered, distilled, and solidified.

An SRC plant in Kentucky will start demonstration operations in 1983. If successful, four additional modules will be built by 1988, after the planned startup of Moon Lake unit 1.

Coal-Derived Liquid (CDL) Fueled Steam Generation

A wide variety of synthetic liquid fuels have been produced from coal, including gasoline, kerosene, methanol, heating oil, and boiler grade fuel oil.

CDL fuels can be used in most applications that petroleum fuels are now used, except in combustion turbines due to high corrosion and high NOx emissions. CDL could be used for steam-electric generation. However, commercial supplies of CDL are not expected to be available until the 1990s.

Electrical Energy Storage

Electrical energy storage concepts include underground pumped hydro, compressed air, thermal, pressurized water, battery, fly wheel, and super-conducting magnetic storage systems. None of them can supply the baseload power Deseret needs. Energy storage systems have application only for load management.

At present, none of these storage concepts have been completely researched and developed. Some may become commercially feasible by the late 1980s and other concepts may not be feasible until the late 1990s, if ever.

Oil Shale

Oil shale contains a solid bituminous material called Kerogen which, when heated to a high temperature, will yield a substitute crude oil that can be refined and treated like petroleum.

The largest oil shale deposits occur in Colorado, Wyoming, and Utah. The Bonanza and Rangely sites are located in areas of potential oil shale development. However, oil from oil shale was not considered a viable fuel

alternative to coal for the proposed project because the technology is experimental and could result in a project that is unreliable and far more expensive than the mining, transport, and burning of coal. Instead, electric power generated by Moon Lake would be utilized by oil shale developments.

Tar Sands

Utah has 90 percent of the nation's tar sands, with a reserve of 21.6 to 32.4 billion barrels of oil. The cost of oil from tar sands would be higher than present crude oil prices, thus making the use of oil from tar sands prohibitive in electric power generation. Current energy policy would likely restrict the use of tar sand derived oil for electric power production.

Other Technologies

Various other generation technologies are undergoing research and development. These include liquid metal fast breeder reactors, magnetohydrodynamic, thermoionic, and fushion power generation. These technologies are not expected to become commercially available soon enough to be of immediate benefit to Deseret.

Comparison of Most Viable Generator Alternatives

Four of the more viable generation modes were evaluated in greater detail. Specifically, the first unit of the proposed Moon Lake project, a solar-powered central receiver, a geothermal unit, and a system of wind-powered generators are evaluated in terms of their total capital requirements, fixed operation and maintenance costs, technology development rating, and design/cost estimate rating. In addition, a generation alternative involving a combination of technologies is considered.

Technology Development Rating

As used by the EPRI in a July 1979 special report entited "Technical Assessment Guide," the Technology Development Rating (TDR) applies to the status of a technology with regard to its commercial availability. Table A shows the five levels of the TDR, which range from a rating of "1" where no system hardware has been developed for a technology to a rating of "5" where a technology has significant commercial experience.

A coal-fired power plant measures "5" on the TDR. The proven reliability and substantial operating experience of coal-fired plants weighed heavily in the decision to select a coal-fired plant as the preferred generating option for the proposed Moon Lake project.

Design/Cost Estimate Rating

Also used by EPRI in their Technical Assessment Guide is the Design/Cost Estimate Rating (DER), which is a measure of the source of the information that EPRI used to develop cost data for the alternative energy technologies shown in table B. The higher the DER the more reliable the cost estimates presented in table B. This is because the DER reflects, among other things, the amount of quality of design data available for a particular technology, and more data usually results in more accurate or realistic cost estimates.

TABLE A

Data Rating Explanation

Technology Development Rating

1. No system hardware development
2. Concept supported by laboratory studies and initial hardware development
3. Concept supported by small pilot facility
4. Concept verified by integrated demonstration plant
5. Significant commercial experience (more than five commercial plants)

Design/Cost Estimate Rating

1. Technology design/cost goal (or value developed from literature data)
2. Simplified process design
3. Preliminary process design
4. Detailed process design
5. Data based on detailed process and mechanical designs or historical data from existing plants

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TABLE B

Comparative Generation Costs and Development Status[a]

	Moon Lake Project Unit 1	Solar Central Receiver Hybrid Cycle Design	Geothermal Binary	Wind Power
Unit Size - Net Electrical Output in MW.	1-400	1-100	1-50	25-2.5
Total Capital Requirements for End-of-year 1978 Startup in Dollars per Kilowatt.	1,195[b]	1,540	720	855
Fixed Operation and Maintenance Costs in End-of-year 1978 Dollars per Kilowatt per Year.	11.6[b]	15.0	27.6	7.0
Technology Development Rating (see Table A)	5	2	3	2
Design/Cost Estimate Rating (see Table A)	4	1	3	3

[a]Electric Power Research Institute, 1979.

[b]Burns and McDonnell, 1980d. The two cost estimates given here are preliminary and are subject to revision.

The EPRI-developed DER was applied to generating unit 1 of the proposed Moon Lake project as is shown in the first column of table B. The coal-fired unit 1 placed "4" on the DER, as shown in table A, the highest rating of the energy technologies considered.

Capital, Operating, and Maintenance Costs

Table B shows the estimated total capital requirements and fixed operation and maintenance costs for the four energy technologies discussed in this supplement. These estimates are shown in end-of-year 1978 dollars.

These cost estimates demonstrate that unit 1 of the proposed project, with a net electrical output of 400-MW, could produce power more economically than the alternative technologies. This is true even though the energy costs per kilowatt hour for geothermal and wind power are less than that of unit 1 because their cost estimates are based on units of significantly less capacity than the 400-MW unit.

Project Schedule

A coal-fired power plant could be built and placed in operation by early 1985, whereas new energy technologies probably could not be made operational for this project by that date.

APPENDIX 8

Power Purchase Availability

On September 8, 1980, Deseret contacted all utilities in the Intermountain West to ascertain whether or not surplus power would be available between 1985 and 1987. The following letters are the replies received by Deseret.

DESERET
Generation & Transmission Co-operative
5722 South 300 West · Box 88 · Sandy, Utah 84070 · (801) 566-1238

M E M O R A N D U M

TO: Merrill J. Millett

FROM: Soren K. Sorensen

DATE: September 8, 1980

SUBJECT: Availability of Surplus Capacity in the Intermountain and Western Area

In accordance with your request to substantiate our earlier data, I this date contacted all companies in the Intermountain and Western Area to ascertain whether they have any surplus capacity during the years 1985 to 1987. Summarized below are their comments:

I. PUBLIC SERVICE COMPANY OF COLORADO
Denver, Colorado
Ed Griffen (303) 571-6634

Ed indicated that Public Service Company of Colorado (PSCC) is short approximately 200 megawatts in 1985, 300 to 500 megawatts in 1986, and over 500 megawatts in 1987. PSCC wants to meet with us concerning any excess capacity which PSCC could acquire from Deseret's Moon Lake Project to cover their shortage.

II. WESTERN AREA POWER ADMINISTRATION
Salt Lake City, Utah
Ken Wilson (801) 524-5493

Western Area Power Administration (WAPA) could have some energy during 1985, 1986, and 1987. However, no capacity is available. Ken wants to meet with us concerning WAPA purchasing capacity from Deseret's Moon Lake Project if available and on a lay-off basis.

III. SALT RIVER PROJECT
Phoenix, Arizona
Jim Trangsrud (602) 273-5900

Salt River Project (SRP) is projecting some surplus at the present time. However, the projected surplus is based on present load growth and on the Palo Verde Nuclear Unit being ready for commercial operation in 1983. SRP's sale to Deseret would be firm when available; however, if SRP did not have sufficient capacity Deseret would be cut back and SRP would not share in any curtailment with Deseret. SRP peaking capacity is generated by burning oil and base capacity is generated by burning coal. Therefore, peaking capacity could become extremely expensive as oil prices continue to increase. Their present projected costs including transmission escalated at 12% compound annually are as follows:

1985	78 mills/kwh
1986	88 mills/kwh
1987	98 mills/kwh

The 1985 costs are comparable to the in-service projected mill/kwh of the Moon Lake Project. Since the capital costs of the Moon Lake Project would no longer escalate, SRP's 1986 and 1987 costs would be comparatively higher in relationship to Moon Lake's costs. Moon Lake's projected costs are as follows:

$ 975,511 in 1985
4,683,117 in 1986
8,786,161 in 1987
3,000,000 in 1988 and for the next 35 years

Total cost increase to rate payers totals $119,444,789.

The delay of the Moon Lake Project and purchasing power from SRP is not economically feasible as SRP is offering only a system sale contract if, and only if, capacity is available. Therefore, Deseret would not be assured of a future firm power supply. Also, SRP is including in its capacity resources a nuclear unit still under construction and which could be very difficult to license in today's political environment. Also, there are questions whether sufficient transmission exists between SRP's service area and Deseret's. Based on these preliminary discussions with Mr. Trangsrud, purchasing power from SRP is not economically feasible, might be physically impossible, and the capacity would not be

guaranteed firm.

IV. PACIFIC POWER & LIGHT
Portland, Oregon
Robert B. Lisbakken (503) 243-1122

Pacific Power & Light has no excess capacity and is currently searching for additional resources.

V. NEVADA POWER COMPANY
Las Vegas, Nevada
Mr. Miller (702) 385-5011

Nevada Power Company (NPC) will need some capacity in 1985 to 1990 if the Warner Valley Project is delayed. The draft EIS is presently under consideration. Therefore, this project is no further along than the Moon Lake Project. NPC wants to negotiate with Deseret for any excess capacity from the Moon Lake Project.

VI. UTAH POWER & LIGHT COMPANY
Salt Lake City, Utah
Dean Bryner (801) 535-4290

Utah Power & Light Company (UP&L) has no surplus capacity during 1985 to 1987. In fact, UP&L is short approximately 200 to 300 megawatts after the termination of the ICPA and Moon Lake Power Contracts in March of 1985. They desire to negotiate immediately for any surplus from the Moon Lake Project.

VII. COLORADO UTE
Montrose, Colorado
Fred Kuhlemeier (303) 249-4501

Colorado Ute (CU) has some small surplus capacity during 1985 and 1986; however, CU could not supply Deseret's requirements. Mr. Kuhlemeier indicated the Public Service Company of Colorado is presently negotiating with CU to purchase their surplus capacity. Mr. Kuhlemeier also indicated that transmission between Colorado Ute and Deseret does not have sufficient capacity to transmit the large amount of power needed by Deseret.

VIII. SOUTHERN CALIFORNIA EDISON COMPANY
Los Angeles, California

As indicated in their letter dated March 13, 1980, Southern California Edison Company desires to purchase any surplus capacity Deseret would have from the Moon Lake Project.

SKS:e

UTAH POWER & LIGHT COMPANY
P. O. BOX 899
SALT LAKE CITY, UTAH 84110
801 - 535-4290

DEAN L. BRYNER
VICE PRESIDENT
SYSTEMS & RESOURCE PLANNING

March 5, 1980

Mr. Joseph Fackrell
Intermountain Consumer Power Assoc.
P.O. Box BB
Sandy, Ut 84070

Dear Mr. Fackrell:

This letter is in response to your telephone request for information concerning availability of power and energy from Hunter No. 3 and No. 4 Units to be in service in 1983 and 1985.

These resources are totally committed, and no power is available from them for joint ownership with others.

We currently project that the next unit added by our company beyond Hunter No. 4 will be in the 1987-88 time period. Some capacity in 1987 or 1988 may be available for joint ownership if we receive an early commitment.

If you have need for further information, please let us know.

Very truly yours,

DLBryner

Public Service Company of Colorado
P.O. BOX 840 · DENVER, COLORADO 80201

September 8, 1980

Mr. Soren Sorensen
Box BB
Sande, Utah 84070

Dear Mr. Sorensen:

Enclosed you will find a copy of our resource schedule. The following deficiencies in capacity exist in our resource schedule.

1985	211 MW
1986	525 MW
1987	503 MW
1988	234 MW
1989	486 MW

These deficiencies would put us in a position to negotiate for 200 MW minimum through this period.

We have been in contact with power producers in Nebraska, Colorado and Wyoming and have not been successful in contracting capacity and energy during this time frame.

Inquiries northwest, southwest and west of us have not as yet been actively pursued.

If you need more information please feel free to call me.

Very truly yours,

Ed Griffen

E. A. Griffen, Supervisor
Electric Load and Power
Resources Planning

(303) 571-6634

EAG:mt

Enclosure

Salt River Project

WATER · POWER

BOX 1980 PHOENIX, ARIZONA 85001 TELEPHONE 273-5900

September 16, 1980

Mr. Soren Sorensen
Deseret G&T
Box BB
Sandy, UT 84070

Dear Mr. Sorensen:

In response to your telephone inquiry as to excess capacity available to purchase from Salt River Project in the 1985-87 time period, please consider the following information as preliminary in nature:

Time Period	Requested Amount
1985	200 MW
1986	250 MW
1987	300 MW

SRP could sell such amounts of firm capacity and associated firm energy, subject to the following conditions:

1. Deliveries from SRP system would be contingent upon serving SRP's own firm customer load first.

2. The sale would be contingent upon commercial operation of each of three Palo Verde nuclear units within one year of current schedule (Unit 1-May, 1983; Unit 2-May, 1985; Unit 3-May, 1987).

3. The Purchaser provides transmission from Phoenix area (SRP is interconnected with WAPA at Pinnacle Peak).

4. The sale would be subject to approval of all terms and conditions by SRP Board of Directors.

5. The price (expressed in 1980 dollars) is estimated to be:

   Demand Charge - $4.00/kW/Month (escalated from 1980 by Handy Whitman index for generation plant construction)

   Energy Charge - 1985 - 40 mills/kWh
   1986 - 37 mills/kWh
   1987 - 42 mills/kWh

   NOTE: These are estimated average yearly production costs; actual pricing would reflect seasonal and on-peak/off-peak price structure. (On-peak rates would be escalated from 1980 based on an oil price index; off-peak rates would be escalated from 1980 based on a coal price index).

Mr. Soren Sorensen
September 16, 1980
Page 2

We would be pleased to discuss such a sale further with you. If you have any questions regarding the above information, please call Jim Trangsrud (602) 273-2516.

Very truly yours,

Dale L Pohlman

DALE L. POHLMAN
Manager, System Planning

DLP/ske

APPENDIX 9

Examples of Existing Legislation and
Incentives Favoring Conservation

Several Federal and State laws, tax credits, low interest loans, building codes, etc. are designed as mandates or incentives to conserve energy. Those which apply in Utah, Nevada, and Colorado are described below.

Federal Legislation and Incentives

One part of the 1978 five-part National Energy Act and the Power Plant and Industrial Fuel Use Act halts construction of power plants dependent on oil and gas and will phase out the use of gas as a utility fuel by 1990. The other four parts contain measures to accelerate the development of alternative energy sources and improve energy efficiency:

> The National Energy Conservation Policy Act requires that utilities provide energy audits to residential customers, identify conservation and solar measures, and provide contracting and financial assistance for their implementation. It extended weatherization grants to low-income homes, and set up an assistance program to improve energy efficiency of schools and hospitals, and public buildings.
>
> The Energy Tax Act authorizes homeowners tax credits for installing insulation, caulking, other energy conservation materials, and/or renewable energy systems such as geothermal, wind, and solar. The Act also provides tax incentives for businesses to conserve energy and install alternative energy systems.
>
> The Natural Gas Policy Act incorporates intrastate gas markets into the controlled interstate market, and provides for phased deregulation of new gas prices by 1985. The Act requires that incremental costs be passed on only to large industrial and utility users, while maintaining a controlled price for residential and commercial users.
>
> The Public Utility Regulatory Policies Act requires state regulatory bodies and publicly owned utilities to consider 11 voluntary rate design standards--including time-of-day, seasonal, interruptible, and lifeline rates, the prohibition of declining block rates, and the consideration of cost-of-service pricing. It establishes a loan program to aid development of small hydroelectric facilities, and authorizes Federal rules requiring utilities to buy or sell electricity at just and reasonable rates from qualified industrial cogeneration facilities and from individuals or organizations employing nonconventional energy sources that use wind and geothermal technologies.

Other initiatives are under discussion in Congress to expand provisions of the 1978 Acts.

State of Utah

Utah Tax Credit. The Utah State tax credit program became law in January 1980. It allows a 10-percent credit on active or passive solar systems, wind systems, and hydroelectric systems for homeowners and commercial establishments.

Utah Energy Code. Adopted in January 1978, the code established minimum energy conservation standards of construction. It regulates building design for adequate thermal resistance, air leakage, and efficient mechanical, electrical, and lighting systems. It also established guidelines and requirements related to remodeling existing buildings, excluding mobile homes.

State of Nevada

Nevada Tax Credit. Since 1977 a property tax credit of up to $1,000 has provided relief to homeowners with solar, wind, or geothermal heating and cooling systems.

Nevada Energy Code. Enacted in January 1978, the code established energy conservation standards for new building construction. It does not address remodeling of existing buildings or mobile home construction.

State of Colorado

Residential Tax Credits. Energy conservation income tax credits for expenditures between January 1, 1980, and January 1, 1986, permit deduction of up to 20 percent (to a maximum of $400) of the cost of residential energy conservation measures (i.e., caulking, insulation, furnace modification, storm windows, etc.) (CEES). Unused portions of the credit can be carried forward for 5 years after the year of expenditure.

Weatherization Assistance. This program aids families with up to $800 worth of installed "weatherization" materials such as insulation, storm windows, storm doors, caulking, and weather stripping. Additional services for low income families can include up to $100.00 in building repairs needed for effective weatherization and up to $50.00 for furnace repairs.

Commercial Tax Credits. During tax years 1981 through 1986, Colorado business, industrial, and agricultural sectors can take advantage of several State or Federal tax incentives for the installation of equipment designed to reduce demand for oil and natural gas, to use renewable energy resources, or to recycle waste. This bill allows deductions for costs of solar, wind, and any other energy property. This State credit also includes all the energy properties defined under the 1978 Federal Energy Tax Act including gasohol production facilities for on-farm use only, but excluding pollution control equipment. It includes alternative energy equipment, solar or wind systems, commercial energy saving systems, and waste recycling equipment.

Building Conservation Standard. Passed in 1979, the bill changes minimal prescriptive standards for residential buildings (established by S.B. 159 in 1977 and requiring minimal insulation, double glazing, and weatherstripping)

to thermal performance standards. Thermal performance standards factor in local climatic conditions, allow increased flexibility of design and conserve more energy in new construction (S.B. 432 dealing with non-residential building standards was passed by the 1977 legislature) (THK Associates, 1979).

APPENDIX 10

Design Alternatives

Alternative Cooling Methods

Wet-Evaporative Cooling

The wet-evaporative cooling system involves the extraction of water from a raw water source. The raw water is treated and pumped into a circulating water system (tube side of the main-steam condenser), where the water picks up latent heat through conduction as the steam exhausted from the low pressure turbine; the heated water then flows to the mechanical-draft cooling tower. There the water falls through the tower's fill section where the heat is dissipated by evaporation. The cooled water flows to the tower basin from which it is pumped back into the condenser and the cycle is repeated.

Wet, mechanical-draft cooling towers are widely used at steam-electric power plants throughout the United States (Dickey, 1978). In the past decade, mechanical-draft cooling towers, along with natural-draft towers, have become the predominant cooling system for power plants (Reynolds, 1980). They have proven to be reliable and durable machines for the large scale cooling operations of power plants.

Wet, mechanical-draft cooling towers installed at the proposed Moon Lake project would require less space than dry or wet/dry cooling towers. The mechanical-draft tower for the proposed project's first unit would occupy approximately 35,000 sq. ft. In comparison, the dry cooling tower at the 330-MW Wyodak power plant in Wyoming (the world's largest dry cooling tower) occupies an approximate area of about one city block or 180,000 sq. ft. Wet/dry cooling towers occupy less area than dry towers but still more than the proposed mechanical-draft towers. The wet/dry cooling tower of the 500-MW San Juan unit 3 in New Mexico (the largest wet/dry tower in the United States) occupies about 135,000 sq. ft. (Public Service Commission of New Mexico, 1980).

Wet, mechanical-draft cooling towers affect the environment in several ways (Umenhofer and Derezotes, 1980). They produce a visible vapor plume that can influence an area's visual attractiveness. They release to the atmosphere water droplets, or "drift", containing dissolved solids that, if deposited in and around the power plant site, could corrode equipment and harm vegetation. In addition, closed-cycle cooling designs like wet-evaporative systems experience a build up of suspended and dissolved contaminants which must be maintained at acceptable levels and which eventually require treatment and disposal.

However, the environmental effects of the proposed project's mechanical-draft cooling towers are expected to be minimal. Plume development from the towers should be hampered because plumes are most prevalent during periods of high relative humidity, and such humid periods are infrequent in the project area. The characteristic low-level plumes of mechanical-draft cooling towers tend to disperse rapidly due to ground-induced air turbulence (Umenhofer and Derezotes, 1980). Further, recent advances in "drift" eliminator technology have resulted in considerable reduction in "drift" emission rates, and methods have been developed to safely treat and dispose of cooling tower wastes.

An economic analysis, which estimated the capital costs of the wet-evaporative, dry, and wet/dry cooling systems, showed that the wet evaporative system would cost approximately $9.24 million. In comparison, the dry cooling

system would cost an estimated $27 million and the wet/dry system could cost an estimated $30 million. This analysis calculated only the capital costs of installing the three cooling systems on the first generating unit of the proposed Moon Lake project. A more complete economic analysis, including operation and maintenance costs, could not be performed with any certainty of accuracy because of the lack of operating and maintenance data for the wet/dry and dry cooling systems, which have gone into large scale use only in the last few years.

Two units employing two wet-evaporative cooling towers and operating at design conditions (100 percent load and 80 percent of the time) would consume water at an approximate rate of 19.5 cfs. Dry and wet/dry cooling systems operating at similar conditions would consume water at the approximate rates of 2.3 cfs and 12.0 cfs, respectively. Deseret holds a 30 cfs water right on the Green River, which could be the water source for a generating station at the proposed Bonanza site. Deseret and REA's opinion is that the water saving that would result from a dry or wet/dry cooling system would not justify the added costs nor the technical uncertainties of these cooling systems at the Bonanza site.

Dry Cooling

A dry cooling system consists of either a mechanical or natural-draft cooling tower, which is composed of several finned-tube heat exchangers. The exchangers use air, rather than water, to cool the fluid (either turbine-exhaust steam or turbine condensate) circulated in the heat exchangers' tubes.

Dry cooling's principal advantage is its extremely low water consumption. A dry cooling system servicing the proposed two-unit generating station would consume water at an approximate rate of 2.3 cfs. In addition, dry cooling can eliminate, or at the least alleviate, plume formation and "drift" emissions common to wet-evaporative cooling systems.

Long-term performance and dependability data on the use of dry cooling systems at power plants is currently unavailable. Dry cooling systems have become a viable cooling option for large power plants only within the last few years. Currently, the largest dry cooling system in the world is operating at the 330-MW Wyodak steam-electric plant near Gillette, Wyoming (Brodgen, 1980). In operation since June 1978, the Wyodak plant's dry cooling system has performed well to date; however, its long-term reliability remains uncertain, particularly in comparison with the well documented performance record of wet-evaporative cooling systems.

Dry cooling systems are inherently costly for many reasons (McHale et al., 1980). The low heat capacity of air and the low heat-transfer coefficients of air-cooled heat exchangers require large air volumes, large surface areas, and large costly towers. The capital costs alone for a dry cooling system for the proposed project's first unit were estimated to be nearly three times higher than the costs of a wet-evaporative cooling system.

There are also hidden costs associated with dry cooling systems. The performance of the dry-cooled plant is particularly poor (compared with the wet-cooled plant) during peak temperature periods. Since most United States utility systems experience a summer peak power demand, the use of dry cooling generally results in significant capability penalties in addition to the replacement energy cost penalties. For mechanical-draft dry cooling systems, the required large air volumes result in high fan power requirements which,

compared with wet-evaporative cooling towers, result in large replacement energy costs. Further, since dry-bulb temperatures are higher than wet-bulb temperatures, the dry cooling system is forced to reject heat to a higher temperature sink. Compared with wet cooling systems, this results in higher turbine exhaust pressures, poorer plant performance, and higher replacement energy costs throughout the year (McHale et al., 1980).

Wet/Dry Cooling

The wet/dry cooling system combines the features of both the wet-evaporative and dry cooling systems. The typical wet/dry cooling tower consists of a dry cooling section placed on top of a wet cooling section. This arrangement enables ambient air to be drawn through both the dry and wet sections in parallel paths; air streams converge and are mixed before being discharged to the atmosphere. Water to be cooled is passed through the dry air-cooled section then through the wet section of the tower. Once cooled, the water collects in the tower basin for recycling back to the main-steam condenser.

Although technically feasible, wet/dry cooling systems are a recent option for cooling operations at large power plants; and therefore, have not as yet proven themselves to perform as reliably or as efficiently as the wet-evaporative cooling system. The largest wet/dry cooling tower in the United States today is in operation at the 500-MW San Juan unit 3 of the Waterflow generating station in New Mexico. Unit 3 began commercial operation in December 1979 (Public Service Commission of New Mexico, 1980).

Through the wet/dry cooling tower's action of mixing the heated dry air stream and the wet air stream, the wet air stream is diluted. Because of this dilution of the wet air stream, a less visible plume is created as compared with wet-evaporative cooling. During favorable weather conditions (e.g., low relative humidity), a visible plume is virtually eliminated; during more adverse conditions, plume density and persistence are substantially reduced (Elliott, 1973).

Besides plume control, another advantage is water conservation. At plant sites where (1) water is not available for making up the evaporative losses of a wet cooling system or a cooling pond; or (2) water may be available only periodically, a wet/dry tower may prove a viable cooling system for a steam-electric power plant. For the proposed Moon Lake project, it was estimated that a 50-percent wet/dry cooling tower installed for the first unit would consume water at an approximate rate of 6 cfs. Assuming that two units each cooled by a 50-percent wet/dry tower would consume water at an approximate rate of 12 cfs, a wet/dry cooling system would consume about 38-percent less water than a wet-evaporative system.

It is estimated that a 50-percent wet/dry cooling tower installed at the first unit would cost $30 million. This estimated cost is about three times the estimated cost of a wet-evaporative cooling system.

Once-Through Cooling

Once-through cooling consists of an open-cycle system in which the water is removed by an intake structure from a water source, pumped through the main-steam condenser in one or more cycles to pick up the latent heat of condensing steam, and is then returned to the water source at a point removed

from the intake structure. The discharged water's heat is primarily dissipated through surface evaporation. The applicability of once-through cooling is dependent on the availability of an adequate water supply to carry off the waste heat and the ability of the receiving water body to absorb the thermal energy.

Before the 1970s, once-through cooling was the predominate cooling system used at power plants in the United States (Reynolds, 1980). In 1973, 60 percent of the 769 operating fossil-fuel, steam-electric plants in the United States used once-through cooling (Schubel and March, 1978). These systems were widely used because of the availability of water and low capital and operating costs. Moreover, when compared to closed-cycle systems, the water temperature of the circulating water in the open-cycle, once-through system tends to be lower, allowing a higher generating efficiency (EPA, 1974).

In the past decade, the use of once-through cooling systems at power plants has sharply declined. This abrupt decline was caused by the lack of sufficient quantities of water at many potential plant sites and by governmental policies favoring the installation of closed-cycle systems in power plants (Reynolds, 1980).

Once-through cooling systems can significantly affect the aquatic environment, primarily by withdrawing large quantities of water and by discharging heated and often contaminated water. The typical cooling-water intake structure is equipped with fixed or moving screens which are designed to prevent large, solid objects from entering pumps. Fish are often trapped or impinged on these screens and killed or injured as a result. Also, organisms small enough to pass through the intake screens and drawn into the cooling system are exposed to sudden temperature and pressure changes as well as purely mechanical damage. This process, called entrainment, is detrimental to plankton, young fish, and small invertebrates, causing death in most instances.

Once-through cooling systems also affect the aquatic environment by the addition of waste heat and various chemical substances to discharged cooling water. Water discharged from the condenser may be as much as 27° F higher than that of the water entering the condenser. Thus, the temperature of heated cooling water discharged to an artificial or natural water body may exceed the maximum temperature tolerance of benthic algae, benthic invertebrates, and organisms in the water column.

In addition to heat, various toxic or potentially harmful substances may also be added to cooling water discharges. Copper, for example, is normally eroded from condenser tubes, and chlorine (or other biocides) is routinely added to cooling water to reduce bacterial growth in the condenser tubes or to control other types of fouling organisms in other parts of the cooling system (USDI, 1977).

Generally, once-through cooling is a more economical cooling system than the closed-cycle systems. Although the capital costs of the large capacity pumps and the large diameter pipes required for once-through cooling are high, operating and maintenance costs are usually relatively low due to the system's basic simplicity of design. Because of the high capital costs of pipe and pumps, most power plants using once-through cooling are located close to their water source to reduce the length of the intake and discharge pipes and to avoid the need for booster pumps. If located too far from its water source, a power plant may not be economically served by a once-through cooling system.

A typical 800-MW steam-electric power plant using a once-through cooling system could require a maximum cooling-water flow rate of over 1,200 cfs. For

a once-through cooling system to be feasible, the water source must be able to supply water at this maximum rate under all climatic and hydrologic conditions. However, the actual water consumption for such a system would be less than that of a wet-evaporative cooling system.

Once-through cooling was not considered a practicable cooling system for the proposed Moon Lake project. The costs of once-through cooling would be uncompetitive with wet-evaporative cooling because of the proposed generating station's distance (a minimum of 5 miles) from a potential water source. It is also questionable whether any of the project's potential water sources could, under all hydrologic conditions, produce a sufficient flow rate to make once-through cooling feasible.

Cooling Ponds

A cooling pond is normally a man-made water body into which the heated circulating water of a power plant is pumped to be cooled and stored for eventual recirculation in the main-steam condenser. Although similar to once-through systems, cooling ponds are closed systems in that all the heated water leaving the condenser is discharged into the pond. The water's heat is dissipated by a net positive heat exchange across the water surface affected by evaporation, radiation, and conduction.

The use of cooling ponds at power plants reached a peak in the mid 1970s (Reynolds, 1980). They are most applicable in areas where water is plentiful and where circumstances make once-through cooling infeasible. For example, the Federal Power Commission estimated in 1969 that about 32 percent of the generating capacity in the Texas-Gulf states was served by cooling ponds or lakes (Brady, 1975).

A cooling pond must have sufficient surface area so that it cools the water to a temperature that would insure satisfactory operation of the power plant. A pond's size is primarily related to the power plant's generating capacity, and approximations of 1 to 3 surface acres per MW have been cited (EPA, 1974; and Bovay Engineers, Inc., et al., 1978). An 800-MW plant would require a cooling pond from 800 to 2,400 surface acres. A cooling pond at the proposed project could, therefore, require the plant site to be approximately doubled in size. Cooling ponds could not provide the project with sufficient economic or any other advantage to outweigh the cost of acquiring additional land nor the land's removal from future alternative uses.

Cooling ponds often prove most practical and economic in areas where rainfall is sufficient to replenish evaporative losses from the pond. In these areas the costs of a large pump and piping system are eliminated. Rainfall in the project area is not sufficient (8 inches annual average) to replenish the pond's evaporative losses, which could be expected to be high due to the area's typical low humidity and the high level of incoming solar radiation (400-450 langleys). Therefore, no cost savings could be realized from elimination of a pump and piping system. Further, because of the area's arid climate, no substantial water savings would probably accrue from the use of a cooling pond in comparison with wet evaporative cooling.

Cooling ponds generate visible surface fogging under certain meteorological conditions (e.g. temperature inversions). During periods of low surface temperatures, this fog would tend to settle in low areas rather than rising and more quickly dispersing as cooling tower plumes characteristically do.

A cooling pond was not selected as the preferred cooling system because it offered no substantial environmental, water, or cost-saving advantages over the wet-evaporative system.

APPENDIX 11

Deseret's Proposed Mitigation of Project-Induced
Socioeconomic Impacts

The overall impact on local political subdivisions and communities from the construction and operation of the Moon Lake power plant, Deserado Coal Mine, associated transmission corridors, and other rights-of-way would occur in several principal areas. These principal areas will be addressed under the headings of housing; water and sewer; education; transportation; health care; law enforcement, social services, recreation, and fire protection; social integration; and general measures.

The mitigation plan for project responsibility in these areas would be tailored to complement public and private capabilities and would appropriately compensate local governing bodies for the socioeconomic impact adjustment costs which exceed their financial ability to provide during the initial stages of project development. As the project approaches commercial operation, revenues derived from taxation of project properties and project-related population could provide sufficient funding for adjustment costs to include bond retirement and other public debt which may have been acquired for essential capital improvements in anticipation of such revenues.

A. HOUSING

Neither the Ashley Valley (Vernal, Maeser, Naples, Jensen) nor the Rangely local markets can be expected to provide the quantity of housing necessary in the required time frame without some outside assistance. Private developers have obtained approval for several subdivisions in each market area. However, the present high cost of money and resulting depressed market conditions have caused a slowdown which must be stimulated into greater activity. Deseret's and Western Fuels' management would initiate contacts with local and regional developers to provide them with information on projected employment levels and housing needs within the planned construction schedule. The profit incentive could be followed up, as appropriate, with occupancy guarantees and possibly down payment guarantees or advances. Such guarantees would require a cost monitoring-inspection agreement to assure reasonable cost, quantity, and conformance with quality construction.

Market conditions could make it necessary to subsidize construction of facilities for workers desiring to utilize campers or recreational type vehicles for temporary quarters or for those seeking singles quarters.

B. WATER AND SEWER

The water supply in Ashley Valley requires additional capacity and assured quality over the long term. Plans are currently being developed to utilize water from the Red Fleet Reservoir which would provide ample capacity. However, since this would necessitate construction of a pipeline and treatment plant, local water officials may elect to drill additional wells or acquire other water rights. It may be necessary to guarantee bonds or provide advance funds with an offsetting tax credit to assist in financing an adequate water supply.

The Ashley Valley Water and Sewer Improvement District has contracted for an expansion of the sewer system by construction of new mains and a new lagoon treatment system. The projected capacity would be adequate to accommodate the

increased population caused by this project. As necessary, hookup fees should be adjusted to fund the local cost of the new sewage collection and treatment facilities.

The Town of Rangely has and is constructing new water and sewage facilities with capacity to handle normal growth and anticipated project impacts. In so doing, Rangely has incurred a long-term debt. There would be discussions with town and county officials concerning possible prepayment of the coal severance tax to assist in retiring the long-term debt.

C. EDUCATION

The Uintah School District has a program underway to meet growing classroom needs. A new elementary school opened for the 1980-1981 school term. Land has been acquired for additional school facilities. It may be advisable for Deseret and Western Fuels to guarantee a bond or, if necessary, provide temporary classroom facilities. Close liaison should be maintained with the District to provide assistance of the type needed as it is required.

The Rangely School District completed new school facilities in 1978 which provided physical capacity sufficient to handle anticipated demands. The Deserado Coal Mine tax base would provide major financing for the school district operation and maintenance.

The Uintah and the Rangely School Districts would both need to hire additional professional and other staff personnel and to fund other operating costs before tax benefits are available. Deseret and Western Fuels would assist in financing these front end costs through a prepaid tax or other contractural arrangement so that funds would be available when required. Additionally, consideration would be given to enhance recruiting efforts for professional personnel by including them within the housing requirements of project personnel.

D. TRANSPORTATION

The primary impact on transportation services for project personnel would be increased congestion on the limited road network leading from the communities to the project sites. This would be mitigated by the use of bus service from various collection points to the work sites. In addition to relieving congestion, busing would save on energy resources and would also reduce what could be a major maintenance requirement on roads designed and built for limited traffic. Further, traffic control efforts would be minimized through the reduction in number of vehicles moving to and from the work sites.

Uintah County has an advanced plan for the construction of a new road from the Vernal area to Bonanza. Deseret and Western Fuels are working with the county to finalize the design for the road. It is anticipated that prepayment of sales taxes may be used to further advance the construction effort. Completion of the road would greatly reduce travel time and distance between Utah communities and the Bonanza plant site and provide an additional all-weather means of access.

E. HEALTH CARE

Both Uintah and Rio Blanco Counties have good hospital facilities but there is concern about the number of medical personnel available to provide

needed services. Other areas of concern arise from possible lapses of medical insurance coverage as new workers are hired for the project and the need for emergency ambulance service at the construction sites.

These problems would be mitigated by providing emergency medical facilities at the work sites to include providing a professional medical staff. This should minimize demand on local facilities by work-related "first aid" type treatments. Also, the companies would support local recruiting efforts to obtain and retain professional personnel qualified in the medical specialities required. To cover lags in medical insurance coverage, Deseret and Western Fuels would purchase supplementary insurance and require subcontractors to do the same. Also, both companies would contract for ground and air emergency ambulance services. The medical services would be supplemented through a comprehensive and energetic safety program.

F. LAW ENFORCEMENT, SOCIAL SERVICES, RECREATION, FIRE PROTECTION

The quality of these public services is at satisfactory levels at the present time and can be expanded to handle anticipated impacts without degradation of service. However, additional personnel, facilities, and equipment would be required as construction personnel are hired. Deseret and Western Fuels would coordinate closely with the local communities and would provide assistance as required and mutually agreed upon.

G. SOCIAL INTEGRATION

The influx of over 2,500 new residents would create a sizeable impact on the local communities and the social, cultural, and political structure. This could cause an initial isolation from community life and friction between newcomers and long-time residents. Deseret and Western Fuels have determined that the best way to mitigate this problem is to integrate the new residents into community life as quickly as possible. Initial efforts would be to diffuse the newcomers throughout the communities to prevent development of a "company town" mentality. Both organizations would set up community information programs to acquaint new employees and their families with local laws and services as well as local social and cultural activities. Additionally, an information center with data on housing availability, local places of interest, cultural events, and other items of interest would be maintained by the companies for the benefit of newcomers and long-time residents.

H. GENERAL MEASURES

It is not possible to anticipate all things that may require mitigation. Therefore, Deseret and Western Fuels have employed Community Impact Coordinators to work with local officials on projected mitigation measures and to become aware of any other actions which should be taken to ensure harmonious company-community relations.

APPENDIX 12

Methodology in Alternative Analysis and Evaluation

This appendix has been divided into two sections for analysis purposes:

SECTION A - Numerical Value Procedure:

- List of evaluation criteria.
- Description of numerical value procedure for evaluating potential environmental impacts of electrical transmission corridors.
- Application of numerical value procedure to unit 1 and unit 2 electrical transmission alternatives.
- Tables A through L, illustrating application of the numerical value procedure for the electrical transmission alternatives.

SECTION B - Impact Rating System:

- Definition of items used in the numerical value procedure.
- List of items used in the numerical value procedure.
- Values and weights for items used in the numerical value procedure.
- Formulas used to calculate impact score.
- Adjustment procedure for paralleling existing powerlines.

SECTION A. NUMERICAL VALUE PROCEDURE FOR EVALUATING THE PROPOSED POWER TRANSMISSION CORRIDOR AND ALTERNATIVES

To provide a consistent basis for evaluating the environmental benefits and detriments of each alternative, the following evaluation criteria were established. The alternative which best meets the evaluation criteria is considered to be the environmentally-preferred alternative.

1. Meets at least part of the anticipated energy needs of the utility's service areas consistent with the environmental constraints given below.
2. Creates least project delay.
3. Minimizes disruption of existing land and water uses.
4. Complies with Federal, State, and local land use plans and controls.

5. Avoids impacts to important historic, cultural, and natural aspects of our national heritage, including wilderness areas.

6. Minimizes adverse impacts to water quality.

7. Avoids potential adverse impacts to threatened or endangered species or their habitats.

8. Minimizes adverse effects to existing scenic and aesthetic values.

9. Minimizes disturbance to wetlands and floodplains.

10. Minimizes disruption to existing fish and wildlife habitat.

11. Minimizes potential health and safety hazards.

12. Has the least effect on existing residential areas.

13. Minimizes length and/or costs.

14. Maximizes use of existing transmission corridors.

15. Maximizes energy efficiency.

A numerical value procedure was developed for evaluating potential environmental impacts of alternative electric transmission corridors for the Moon Lake project. The procedure was patterned after that developed and used by the Federal Colstrip Transmission Study Project (Colstrip Project, 1979).

The environmental impact statement (EIS) process involves primarily the analysis of potential impacts on various environmental resources. In the case of power transmission facilities, this impact analysis includes a study area which encompasses the generating source, the destination, and the interval area which includes all reasonable or feasible alternatives for routing the power corridor. This can be a very diverse area, depending on the length of the required transmission line and the nature of the regions crossed.

As explained in Chapter 2, Description of Alternatives, several alternative corridors exist for power transmission from either the Bonanza or Rangely plant site for both units 1 and 2. The alternative corridors are varied and complex in their routing locations and interties. Impacts from a transmission project of this magnitude crossing a large area are likely to be serious and important. The area of potential environmental influence, including all reasonable corridor alternatives, encompasses extreme diversity of physiography, vegetation, wildlife, and other physical resources as well as many social and economic variables. The Federal Colstrip procedure was used to derive numerical values relating to an overall impact potential. Both seriousness of potential impacts and relative importance of impacts on each resource were incorporated. The resultant values (environmental impact scores) were used to make direct comparisons between alternative corridors that could serve the same purpose electrically between two common points. A uniform level of analysis was employed for all lands (Federal, State, and private).

Resource descriptions and quantities used in the following numerical value procedure were obtained from Appendix 5, tables B through H; table 3-27, Chapter 3; and figures 3-8 through 3-23, Chapter 3.

In this procedure, the environmental resources subject to impacts are referred to as determinates. Each determinate was considered to be composed of various lesser or more specific resources termed data items. Table C illustrates the list of determinates and data items used in the evaluation procedure. Each determinate and associated data item, as shown in this table, is discussed in Section B. Details on the development, rationale, and significance of numbers and letters on this table are also discussed in Section B.

The judicious assignment of numbers to resources (as broken down into determinates and data items), combined with a unit number or distance measurement across which the resource is influenced, provide a basis for developing comparative estimates of the severity of impact for each alternative corridor. For this approach to be used, the geographic distribution within the study area of each resource of importance must be known. Hence, only "mappable" resources can be utilized. Mapping such resource data and information shows locations, distributions, and concentration of resources, and thus provides indications of "sensitive areas." In this usage, "sensitivity" includes: (1) locations of "critical" resources which would likely be severely impacted; and (2) locations of environmental areas within which a number of resources share the same space. Having more than one resource which may be impacted in a given location increases the potential for environmental degradation. Thus, increased sensitivity connotes increased probability that a high impact rating would occur for the alternative being evaluated.

Number values which relate to the sensitivity of resources were derived by placing each data item into a low, medium, or high category, based on an estimate of the seriousness of the impact likely to occur on each data item. Each successively higher category was considered to be approximately twice as potentially detrimental in impact as the one before it. Therefore, number weights of 1, 2, and 4 were assigned to the low, medium, and high categories, respectively.

Thus each L, M, or H (low, medium, or high) symbol (table C) refers to the relative seriousness of an impact on each of the data items. To calculate impact scores, the number weights (1, 2, or 4) are used to represent this seriousness rating.

The first step in converting resource information to impact scores was to extract data item information from mapped data, documented on corridor/segment profiles. The length, in miles, each corridor/segment coincided with or crossed mapped data items was recorded. Each level of sensitivity (low, medium, and high) was measured separately, and the mileage results were multiplied by the corresponding number weight (1, 2, or 4, respectively). The sum of these values for each data item represents the data item impact score for the corridor segment being measured.

Using distance measurement (miles) as a basis for impact estimates has the advantage of relating impacts to corridor or segment lengths. This helps to account for the greater potential impacts on longer segments, thus favoring shorter corridors if there is a difference in sensitivity between segments. However, only those determinates which are continuous over all land areas, such as erosion hazard or visual resources, exhibit this advantage. Other determinates, such as vegetation, are discontinuous and the area covered by them is not necessarily related to segment length. Still other determinates

relate to point or number data (e.g., cultural resources and fish) and require special development. Some determinates represent a single identifiable resource, whereas others such as wildlife are composed of a variety of resources.

An additional advantage of estimating impacts in relation to distance is that the impact score per mile of segment can be calculated. The magnitude of this value indicates the suitability of various areas within the study area for electric transmission facilities. In certain instances, longer segments may be preferred if they avoid areas crossed by shorter segments which may have particularly high impact scores per mile.

One additional quantitative adjustment was required to make this procedure viable. A weighting of determinates was necessary to account for the relative importance of different resources (see table C). This adjustment was made by assigning a weight of 1, 2, or 3 to each determinate and multiplying the data item impact score for each determinate by its appropriate weight. Thus, both the sensitivity of a resource to potential impacts plus the importance of that resource are accounted for in the analysis. Formulas and derivations for impact scores are found in Section B.

Tables A and B illustrate the comparative summary of the total adjusted impact scores for the Bonanza or Rangely unit 1 and 2 routes with the fewest environmental impacts. Tables C through L contain supporting data and calculations for the comparative summary tables (A and B).

The impact score by data item for alternatives evaluated are found in tables D through G.

The sum of all determinate impact scores for any alternative equals the total alternative impact score (see tables D to G).

Tables H and I list all determinate and total alternative impact scores for each of the unit 1 and unit 2 alternatives for Rangely or Bonanza plant sites. Comparing total impact scores of alternatives which connect the same two points reveals which alternative would have the least environmental impact.

An adjustment of impact scores was made to account for the existence of powerlines along portions of certain corridor segments (see table 2-12, Chapter 2 for the distribution of existing rights-of-way in the study area). This was entered into the analysis as an additional determinate and is referred to as the parallel advantage determinate. This adjustment was made to account for the generally lower impacts resulting from paralleling existing rights-of-way as opposed to crossing environments not interrupted by powerlines. The parallel advantage determinate is composed of four data items. In this case, the data items do not represent environmental resources; each data item represents a certain number and size of existing powerlines grouped together for evaluation purposes. As with environmental resource data items, the grouped powerlines were assigned number values reflecting the advantage (reduction of impact potential) it represents to the various resource determinates. Resources in six of the seven resource determinates shown in table C were thought to benefit significantly from paralleling existing lines. The weighting of determinates necessary to account for relative importance of different resources was also applied.

Table J shows the breakdown of determinates and data items used in the parallel advantage procedure. Each determinate and associated data item as shown in the table, along with details on the development, rationale, and significance of numbers and letters on the table, are also discussed in Section B.

Formulas and derivations of total impact score adjustments by alternative are found in tables K and L and in Section B.

Tables H and I illustrate the implementation of these score adjustments.

Impacts to each environmental resource vary among the alternative corridors considered, as shown in tables H and I.

Bonanza Plant Site

Bonanza Unit 1 Routing Alternatives

The total adjusted impact score (defined in the preceding narrative) indicate that for the:

Bonanza to Tank Hollow Link (345- 135-kV System)

The applicant's proposed corridor (Upalco-Fruitland) would create the fewest environmental impacts. For the alternatives to this corridor, the Castle Peak-Sowers score indicates 24-percent more impacts; Castle Peak-Fruitland 19-percent more impacts; and Upalco-Sowers less than 1-percent more impacts.

The applicant's proposed corridor impact scores for four of the seven measured resources are lower or equal to those of the alternatives. Visual resources, land uses, and wildlife scores (applicant's corridor) are those that exceed alternative scores.

Impacts on vegetation cover and soil erosion are those which raise the Upalco-Sowers total adjusted impact score above that of the applicant's proposed corridor. It is noted that even though the Upalco-Sowers alternative is a longer route, the adjusted per mile impact score favors this alternative over that of the applicant's proposal. (Upalco-Sowers adjusted score per mile shows 7-percent fewer impacts on a mile basis than the Upalco-Fruitland corridor).

Tank Hollow to Mona Link (345-kV System)

The applicant's proposed corridor (Dairy Fork) would create the fewest environmental impacts. The Utah Valley score indicates 10-percent more impacts while the Thistle Canyon score indicates 1-percent more impacts.

Fewer impacts on visual resources, land uses, and fish are the reasons for the difference in scores between the Dairy Fork and Utah Valley corridors, the largest difference being impacts on visual resources. The 1-percent difference in impact scores between the Dairy Fork and Thistle Canyon corridors is spread across four of the seven measured resources: erosion hazard, visual resources, wildlife, and fish. It is noted that the adjusted score per mile impact score for Dairy Fork and Thistle Canyon are equal.

Price Canyon to Water Hollow (345-kV System)

The Eccles Canyon corridor would create the fewest overall environmental impacts. The Sowers Canyon/Dairy Fork score indicates 30-percent more impacts while the Sowers Canyon/Thistle score indicates 36-percent more impacts.

Fewer impacts on vegetation, soil erosion, visual resources, and wildlife are the reasons for the differences in scores between the Eccles Canyon and

the Sowers Canyon/Dairy Fork/Thistle corridors. On a per mile basis, the Eccles Canyon corridor would have 3-percent fewer impacts than the Sowers Canyon/Dairy Fork corridor and 6-percent fewer impacts than the Sowers Canyon/-Thistle corridor. The considerable difference between the overall impact score and the per mile score is due to the 15- to 15.5-mile greater distance associated with the Sowers Canyon routes.

The Eccles Canyon alternative would establish a new corridor across the Manti-LaSal National Forest. Although the impacts would be fewer with this alternative, the impacts are concentrated in areas of high quality scenery and developed and dispersed recreation facilities. Conflicts would exist with a proposed scenic loop road, i.e., Skyline Drive Road, campground locations and expansions, and summer home developments. Unstable land forms (landslides and slumps) are evident and indicate probable soil and vegetation rehabilitation difficulties. Approved long-wall coal mining operations would cause surface subsidence on a portion of the route and create difficulties in transmission line tower site design and location.

Bonanza to Rangely Link (138-kV System)

The applicant's proposed corridor (Bonanza-Rangely via Little Bonanza) would create the least environmental impacts. The score for Bonanza-Rangely via Mellen Hill indicates 12-percent greater impacts. These greater impacts are associated with soil erosion, visual and land use resources. The applicant's proposal would have 42-percent more impacts on wildlife than the route via Mellen Hill but, due to fewer impacts on soil, visual and land use resources, the total score for the proposal is less than the Mellen Hill route.

Rangely Plant Site

Rangely Unit 1 Routing Alternatives

The total adjusted impact scores indicate that for the:

Rangely to Tank Hollow Link (345- 135-kV System)

The Upalco-Sowers alternative corridor would create the fewest environmental impacts. The impact score for this alternative shows less than 1-percent difference from that of the applicant's proposed corridor (Upalco-Fruitland). The 1-percent difference is spread over visual, land use, wildlife, and fish resources, where fewer impacts would result with the Upalco-Sowers corridor. The Upalco-Sowers corridor does show 10- to 12-percent more impacts on vegetation cover and soil than that of the applicant's proposal. Fewer impacts on four of five of the remaining measured resources offset the total impact score in favor of the Upalco-Sowers corridor.

The Castle Peak-Sowers and Castle Peak-Fruitland alternative scores exceed the Upalco-Fruitland alternative by 22 to 26 percent. These percentages represent significant differences in impact scores in all but fish and cultural resource categories.

Impacts to each environmental resource vary among the alternative corridors considered, as shown in table I.

APPENDIX 12 (continued)

Bonanza Plant Site

Bonanza Unit 2 Routing Alternatives

The total adjusted impact scores indicate that for the:

Bonanza to Mountain Green Link (345-kV System)

The Upalco-Fruitland alternative would create the fewest environmental impacts. The impact score for this alternative shows 8-percent fewer impacts than the applicant's proposed corridor (Lone Tree) and 6-percent fewer impacts than the Castle Peak-Fruitland alternative.

The 6- to 8-percent difference in impact scores is evident in the higher vegetation and soil resource scores for the applicant's proposal and the Castle Peak-Fruitland alternative. The Lone Tree resource score for land uses also show a much larger impact (76-percent higher) than that score for the Upalco-Fruitland alternative. The Castle Peak-Fruitland resource score for wildlife is 22-percent higher than that for the Upalco-Fruitland. Also adding to the percentage difference in impacts is the favorable adjustment for paralleling existing rights-of-way along the Upalco-Fruitland corridor. This alternative received a significantly higher reduction in score than did the Lone Tree or the Castle Peak-Fruitland corridors.

Rangely Plant Site

Rangely Unit 2 Routing Alternatives

The total adjusted impact scores indicate that for the:

Rangely to Mountain Green Link (345-kV System)

The Upalco-Fruitland alternative would create the fewest environmental impacts. The impact score for this alternative shows 5-percent fewer impacts than the applicant's proposed corridor (Lone Tree) and 7-percent fewer impacts than the Castle Peak-Fruitland alternative.

The 5- to 7-percent difference in impact score is evident in higher vegetation, soil, and land use resource scores for the applicant's proposal and the Castle Peak-Fruitland alternative. The Castle Peak-Fruitland alternative also shows 24-percent more impacts to the wildlife resource than does the Upalco-Fruitland alternative. As explained in the Bonanza to Mountain Green discussion, the reduction of impact scores for paralleling existing rights-of-way also added to the percentage difference in impacts, the Upalco-Fruitland receiving the greater reduction.

Unit 2 Routing Alternative

Mona to Ben Lomond (345-kV System)

As part of the unit 1 proposal, a transmission system would be in place up to the Mona location. If this system were double circuited, only the Mona to Ben Lomond 345-kV single circuit line would need to be constructed for unit 2 power transmission requirements. Thus, the additional environmental impacts would be those associated with the Mona-Ben Lomond corridor.

The scores for the unit 1 routing alternative represent impacts associated with either a single circuit or double circult transmission system (differences in total impact scores being negligible between the two systems). If the unit 1 transmission system were not double circuited and the unit 2 345-kV line followed the unit 1 route, resource impacts would be double that shown in table H.

TABLE A

Comparative Summary of Total Adjusted
Impact Scores for Unit 1 Routing Alternative

Routes with Fewest Environmental Impacts		Plant Site: Bonanza	Plant Site: Rangely		Routes with Fewest Environmental Impacts
Upalco-Fruitland[a] (345-138-kV)	=	1,978	2,452	=	Upalco-Sowers (345-138-kV)
Dairy Fork[a] (345-kV)	=	889	889	=	Dairy Fork[a] (345-kV)
Bonanza to Rangely[a] via Little Bonanza (138-kV)	=	287			
Subtotal		3,154	3,341		
<u>Routes Necessary Under Any Alternative Transmission System</u>					<u>Routes Necessary Under Any Alternative Transmission System</u>
Bonanza-Vernal (138-kV)	=	297	712	=	Rangely-Vernal (138-kV)
			403	=	Rangely-Rangely sub.
Total Score		3,451	4,456		

[a]Applicant's proposal.

TABLE B

Comparative Summary of Total Adjusted Impact Score
for Unit 2 Routing Alternatives

Routes with Fewest Environmental Impacts		Plant Site: Bonanza	Plant Site: Rangely		Routes with Fewest Environmental Impacts
Upalco-Fruitland (345-kV)	=	3,280	3,760	=	Upalco-Fruitland
<u>Routes Necessary Under Any Alternative Transmission System</u>					<u>Routes Necessary Under Any Alternative Transmission System</u>
Mountain Green-Ben Lomond[a]	=	532	532	=	Mountain Green-Ben Lomond[a]
Total Score		3,812	4,292		

Note: Mona to Ben Lomond Impact Score = 1,381. (See table G.)

[a]Applicant's proposal.

APPENDIX 12 (continued)

TABLE C

Environmental Evaluation for Power Transmission Corridors

	Determinates[a]						
	Vegetation	Erosion Hazard	Visual Resources	Land Use	Wildlife	Fish	Cultural
Determinant Weight (Importance Value)=	2	2	3	3	2	1	2
Resource Data Items[b]							
Vegetation							
Cultivated	L						
Cold Desert Shrub	L						
Forest	H						
Mountain Brush	M						
Pinyon-Juniper	L						
Wetland	M						
Threatened and Endangered	M						
Riparian (No. of Crossings)	M						
Erosion Hazard							
Slight		L					
Moderate		M					
Severe		H					
Visual Resources							
Retention			H				
Partial Retention			M				
Modification			L				
Maximum Modification			L				
Land Use							
ORV Closures				L			
Scenic Highways (No.)				H			
Developed Recreation Sites (No.)				H			
Urban Development				H			
Commercial Timber				L			
Wildlife							
Critical Habitat							
Big Game							
Winter Range (elk and deer)					M		
Fawning Range (antelope)					H		
Moose					H		
Sage Grouse							
Concentration Areas					M		
Waterfowl Habitat					M		
Raptor							
Nesting Area (golden eagle)					M		
Migration Route (Weber River)					M		
Threatened and Endangered					H		
Wild Horses					M		
Fish (No. of Crossings)							
T&E Habitat						L	
Critical Aquatic Habitat						M	
High Priority Trout Habitat						M	
Substantial Trout Habitat						L	
Cultural							
High							H
Medium							M
Low							L

[a]Determinants Scores: The Importance Value (weights) is developed by the Team. It should be based on 1-2-3. 1 = Somewhat Important, 2 = Important, 3 = Very Important.

[b]Data Items: The Data Items are given sensitivity or impact weights based on 1-2-4. Developed by Team. 1 = Low (L), 2 = Medium (M), 4 = High (H).

TABLE D

Transmission System
Bonanza Unit 1 Routing Alternatives

Derivation of Determinate Scores by Routing Alternative

Resource Data Items	Bonanza to Tank Hollow--- 345-138 kV via Alternative: Upalco-Fruitland		Upalco-Sowers		Castle Peak-Sowers		Castle Peak-Fruitland		Tank Hollow to Mona---345kV via Alternative: Dairy Fork		Thistle Canyon		Utah Valley	
Vegetation														
Cultivated	[a]20.0	[b]40.0	[a]17.0	[b]34.0	[a]5.0	[b]10.0	[a]6.5	[b]13.0	[a]0.6	[b]1.2	[a]N/A	[b]N/A	[a]6.5	[b]13.0
Cold Desert Shrub	72.1	144.2	78.2	156.4	103.2	206.4	95.2	190.4	12.0	24.0	15.0	30.0	13.8	27.6
Forest	8.0	64.0	8.5	68.0	7.0	56.0	8.0	64.0	4.4	35.2	4.0	24.0	3.5	28.0
Mountain Brush	6.5	26.0	9.0	36.0	9.0	36.0	6.5	26.0	18.5	74.0	11.5	46.0	N/A	N/A
Pinyon-Juniper	15.5	31.0	19.1	38.2	15.5	31.0	15.5	36.0	13.3	26.6	19.5	39.2	17.3	67.2
Wetland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	12.5	50.0	19.5	78.0	45.0	180.0	41.0	164.0	2.0	8.0	2.2	8.8	2.2	8.8
Riparian (No. of Crossings)	5.0	20.0	3.0	12.0	8.0	32.0	9.0	36.0	1.0	4.0	2.0	8.0	2.0	8.0
		376.2		422.6		515.4		524.4		173.0		156.0		154.6
Erosion Hazard														
Slight	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moderate	76.7	306.8	74.7	298.8	82.7	330.8	86.7	346.8	N/A	N/A	N/A	N/A	N/A	N/A
Severe	45.0	360.0	57.0	456.0	57.0	456.0	45.0	360.0	48.8	390.4	50.1	400.8	41.1	328.8
		666.8		754.8		786.8		706.8		390.4		400.8		328.8
Visual Resources														
Retention	14.5	174.0	N/A	N/A	N/A	N/A	6.0	72.0	N/A	N/A	N/A	N/A	19.3	231.6
Partial Retention	14.0	84.0	31.5	189.0	36.5	219.0	22.0	132.0	12.6	75.6	20.1	120.6	17.0	102.0
Modification and Maximum Modification	93.0	279.0	100.2	300.6	103.2	309.6	103.7	311.1	37.0	111.0	30.0	90.0	4.8	14.4
		537.0		489.6		528.6		515.1		186.6		210.6		348.0
Land Use														
ORV Closures	8.0	24.0	N/A	N/A	N/A	N/A	8.0	24.0	N/A	N/A	N/A	N/A	N/A	N/A
Scenic Highways (No.)	1.0	12.0	N/A	N/A	N/A	N/A	1.0	12.0	N/A	N/A	N/A	N/A	N/A	N/A
Developed Recreation Sites (No.)	2.0	24.0	1.0	12.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Urban Development	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.0	12.0	1.0	12.0	6.0	72.0
Commercial Timber	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		60.0		12.0				36.0		12.0		12.0		72.0
Wildlife														
Critical Habitat														
Big Game														
Winter Range (moose, elk, and deer)	51.5	206.0	40.0	160.0	45.0	180.0	38.0	152.0	38.0	152.0	40.3	161.2	29.3	117.2
Fawning Range (antelope)	4.0	32.0	4.0	32.0	4.0	32.0	4.0	32.0	N/A	N/A	N/A	N/A	N/A	N/A
Sage Grouse														
Concentration Areas	16.5	66.0	36.0	144.0	48.5	194.0	22.0	88.0	4.0	16.0	4.0	16.0	N/A	N/A
Waterfowl Habitat	9.0	36.0	3.0	12.0	14.0	56.0	18.0	72.0	N/A	N/A	N/A	N/A	N/A	N/A
Raptor														
Nesting Area (golden eagle)	5.0	20.0	N/A	N/A	N/A	N/A	5.0	20.0	N/A	N/A	N/A	N/A	0.5	2.0
Migration Route (Weber River)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	5.0	40.0	2.0	16.0	14.0	112.0	16.0	128.0	N/A	N/A	N/A	N/A	N/A	N/A
Wild Horses	N/A	N/A	N/A	N/A	59.0	236.0	42.5	170.0	N/A	N/A	N/A	N/A	N/A	N/A
		400.0		364.0		810.0		662.0		168.0		177.2		119.2
Fish (No. of Crossings)														
T&E Habitat	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	N/A	N/A	N/A	N/A	N/A	N/A
Critical Aquatic Habitat	1.0	2.0	N/A	N/A	N/A	N/A	1.0	2.0	N/A	N/A	N/A	N/A	N/A	N/A
High Priority Trout Habitat	N/A	N/A	N/A	N/A	N/A	N/A	1.0	2.0	N/A	N/A	1.0	2.0	1.0	2.0
Substantial Trout Habitat	2.0	2.0	4.0	4.0	4.0	4.0	1.0	1.0	2.0	2.0	2.0	2.0	3.0	3.0
		5.0		5.0		6.0		7.0		2.0		4.0		5.0
Cultural														
High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Low	N/A	N/A	N/A	N/A	N/A	N/A	1.0	2.0	2.0	4.0	2.0	4.0	N/A	N/A
								2.0		4.0		4.0		
Total Determinate Score for Alternative		2,044.0		2,048.0		2,646.8		2,453.3		936.0		964.6		1,027.6

APPENDIX 12, TABLE D (continued)

Resource Data Items	Price Canyon to Water Hollow via Alternative: Eccles Canyon		Sowers Canyon/ Dairy Fork		Sowers Canyon/ Thistle Canyon		Bonanza--138 kV System via Alternatives: Bonanza-Vernal		Bonanza-Rangely via Little Bonanza		Bonanza-Rangely via Mellon Hill	
Vegetation												
Cultivated	[a]N/A	[b]N/A	[a]5.0	[b]10.0	[a]N/A	[b]N/A	[a]2.3	[b]4.6	[a]N/A	[b]N/A	[a]N/A	[b]N/A
Cold Desert Shrub	17.5	35.0	14.0	28.0	24.3	49.0	18.6	37.2	16.2	32.4	25.7	51.4
Forest	12.0	48.0	8.0	32.0	6.5	26.0	N/A	N/A	N/A	N/A	N/A	N/A
Mountain Brush	9.0	36.0	21.8	87.0	10.0	40.0	N/A	N/a	N/A	N/A	N/A	N/A
Pinyon-Juniper	N/A	N/A	2.7	5.0	14.2	28.0	4.6	9.2	7.5	15.0	N/A	N/A
Wetland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	0.7	3.0	1.7	7.0	N/A	N/A	8.0	32.0	6.2	24.8	3.0	12.0
Riparian (No. of Crossings)	1.0	4.0	1.0	4.0	4.0	16.0	N/A	N/A	3.0	12.0	N/A	N/A
		126.0		173.0		159.0		83.0		84.2		63.4
Erosion Hazard												
Slight	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moderate	N/A	N/A	N/A	N/A	N/A	N/A	25.5	102.0	23.7	94.8	25.7	102.6
Severe	39.5	316.0	54.5	436.0	55.0	440.0	N/A	N/A	N/A	N/A	N/A	N/A
		316.0		436.0		440.0		102.0		94.8		102.6
Visual Resources												
Retention	10.7	128.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Partial Retention	5.0	30.0	27.0	162.0	49.3	296.0	3.0	18.0	N/A	N/A	N/A	N/A
Modification and Maximum Modification	23.8	71.0	24.5	74.0	11.2	34.0	22.5	67.5	17.5	52.5	25.7	77.1
		229.0		236.0		330.0		85.5		52.5		95.1
Land Use												
ORV Closures	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scenic Highways (No.)	1.0	12.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Developed Recreation Sites (No.)	1.0	12.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Urban Development	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.0	36.0
Commercial Timber	5.7	17.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		41.0										36.0
Wildlife												
Critical Habitat												
Big Game												
Winter Range (moose, elk, and deer)	8.0	64.0	48.7	195.0	54.8	219.0	N/A	N/A	N/A	N/A	N/A	N/A
Fawning Range (antelope)	N/A	N/A	N/A	N/A	N/A	N/A	4.0	32.0	4.0	32.0	4.0	32.0
Sage Grouse												
Concentration Areas	N/A	N/A	25.0	100.0	25.0	100.0	N/A	N/A	N/A	N/A	N/A	N/A
Waterfowl Habitat	1.0	4.0	N/A	N/A	N/A	N/A	1.0	4.0	1.0	4.0	N/A	N/A
Raptor												
Nesting Area (golden eagle)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Migration Route (Weber River)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	N/A	N/A	N/A	N/A	N/A	N/A	1.0	8.0	1.0	8.0	N/A	N/A
Wild Horses	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.2	24.8	2.0	8.0
		68.0		295.0		319.0		44.0		68.8		40.0
Fish (No. of Crossings)												
T&E Habitat	4.0	4.0	3.0	3.0	N/A	N/A	1.0	1.0	1.0	1.0	1.0	1.0
Critical Aquatic Habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High Priority Trout Habitat	1.0	2.0	N/A	N/A	1.0	2.0	N/A	N/A	N/A	N/A	N/A	N/A
Substantial Trout Habitat	3.0	3.0	3.0	3.0	3.0	3.0	N/A	N/A	N/A	N/A	N/A	N/A
		9.0		9.0		5.0						
Cultural												
High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.0	2.0	N/A	N/A
										2.0		
Total Determinate Score for Alternative		789.0		1,146.0		1,253.0		315.5		303.3		338.1

[a]Miles of resource along alternative route (Those resources where the quantitive measure is by numbers or sites is so indicated).

[b]Determinate Score.
Determinate score is derived by the following formula:
Miles (or Nos. of sites) of Resource X Data Item Impact Weights X Determinate Weights = Determinate Score
Refer to Table C for data item impact weights and determinate weights.

APPENDIX 12 (continued)

TABLE E

Transmission System
Rangely Unit 1 Routing Alternatives

Resource Data Items	Derivation of Determinate Scores by Routing Alternative											
	Rangely to Tank Hollow--- 345-138 kV via Alternative								Rangely--138 kV System			
	Upalco-Fruitland		Castle Peak-Sowers		Upalco-Sowers		Castle Peak-Fruitland		Rangely-Vernal		Rangely-Rangely S.	
Vegetation												
Cultivated	[a]20.0	[b]40.0	[a]5.0	[b]10.0	[a]17.0	[b]34.0	[a]6.5	[b]13.0	[a]2.3	[b]4.6	[a]N/A	[b]N/A
Cold Desert Shrub	81.9	163.8	122.3	244.6	87.9	175.8	114.3	228.6	29.0	58.0	8.0	16.0
Forest	9.0	72.0	7.0	56.0	9.5	76.0	8.0	64.0	1.0	8.0	N/A	N/A
Mountain Brush	11.5	46.0	11.9	47.6	14.0	56.0	9.4	37.6	5.0	20.0	N/A	N/A
Pinyon-Juniper	30.0	60.0	30.5	61.0	34.0	68.0	30.5	61.0	17.0	34.0	7.5	15.0
Wetland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	9.5	38.0	43.5	174.0	19.5	78.0	58.0	232.0	2.0	8.0	N/A	N/A
Riparian (No. of crossings)	5.0	20.0	13.0	52.0	3.0	12.0	14.0	56.0	N/A	N/A	3.0	12.0
		439.8		645.2		499.8		692.2		132.6		43.0
Erosion Hazard												
Slight	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Moderate	107.4	429.6	119.7	476.0	105.4	421.6	122.7	490.8	54.3	217.2	15.5	62.0
Severe	45.0	360.0	57.0	456.0	57.0	456.0	45.0	360.0	N/A		N/A	
		789.6		932.0		877.6		850.8		217.2		62.0
Visual Resources												
Retention	18.5	222.0	3.5	42.0	N/A	N/A	9.5	114.0	N/A	N/A	N/A	N/A
Partial Retention	29.0	174.0	38.0	228.0	43.5	261.0	24.5	147.0	18.0	72.0	3.5	21.0
Modification and Maximum Modification	96.0	288.0	135.2	405.6	110.0	330.0	134.7	404.1	36.3	108.9	12.0	36.0
		684.0		675.6		591.0		665.1		180.9		57.0
Land Use												
ORV Closures	8.0	24.0	N/A	N/A	N/A	N/A	8.0	24.0	N/A	N/A	N/A	N/A
Scenic Highways (No.)	1.0	12.0	N/A	N/A	N/A	N/A	1.0	12.0	N/A	N/A	N/A	N/A
Developed Recreation Sites (No.)	2.0	24.0	N/A	N/A	1.0	12.0	N/A	N/A	N/A	N/A	5.0	60.0
Urban Development	N/A	N/A	4.0	48.8	N/A	N/A	4.0	48.0	N/A	N/A	2.0	16.0
Commercial Timber	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		60.0		48.0		12.0		84.0				76.0
Wildlife												
Critical Habitat												
Big Game												
Winter Range (moose, elk, and deer)	72.9	291.6	64.0	256.0	63.4	253.6	45.5	182.0	20.0	80.0	N/A	N/A
Fawning Range (antelope)	N/A	N/A	4.0	32.0	N/A	N/A	4.0	32.0	N/A	N/A	N/A	N/A
Sage Grouse												
Concentration Areas	26.5	106.0	64.0	256.0	46.0	184.0	44.0	176.0	10.0	40.0	15.5	62.0
Waterfowl Habitat	4.9	19.6	24.0	96.0	3.9	15.6	28.0	112.0	1.0	4.0	9.0	36.0
Raptor												
Nesting Area (golden eagle)	5.0	20.0	N/A	N/A	N/A	N/A	5.0	10.0	N/A	N/A	N/A	N/A
Migration Route (Weber River)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	7.0	56.0	24.0	192.0	2.0	16.0	26.0	208.0	1.0	8.0	9.0	72.0
Wild Horses	16.0	64.0	63.0	252.0	16.0	64.0	46.0	184.0	16.0	64.0	N/A	N/A
		557.2		1,084.0		533.2		904.0		196.0		170.0
Fish (No. of crossings)												
T&E Habitat	2.0	2.0	4.0	4.0	2.0	2.0	4.0	4.0	1.0	1.0	1.0	1.0
Critical Aquatic Habitat	1.0	2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High Priority Trout Habitat	1.0	2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Substantial Trout Habitat	2.0	2.0	4.0	4.0	4.0	4.0	N/A	N/A	N/A	N/A	N/A	N/A
		8.0		8.0		6.0		4.0		1.0		1.0
Cultural												
High	N/A	N/A	N/A	N/A	2.0	16.0	N/A	N/A	2.0	16.0	N/A	N/A
Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Low	3.0	6.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	N/A	N/A
		6.0		2.0		18.0		2.0		18.0		
Total Determinate Score for Alternative		2,544.6		3,394.8		2,537.6		3,202.1		745.7		409.0

[a]Miles of resource along alternative route (Those resources where the quantitive measure is by numbers or sites is so indicated).

[b]Determinate Score.
Determinate score is derived by the following formula:
Miles (or Nos. of sites) of Resource X Data Item Impact Weights X Determinate Weights = Determinate Score
Refer to Table C for data item impact weights and determinate weights.

TABLE F

Transmission System
Bonanza or Rangely Unit 2 Routing Alternatives

Resource Data Items	Derivation of Determinate Scores by Routing Alternative: Bonanza to Mountain Green 345-138 kV via Alternatives: Lone Tree		Upalco-Fruitland		Castle Peak-Fruitland		Rangely to Mountain Green 345-kV via Alternatives: Lone Tree		Upalco-Fruitland		Castle Peak-Fruitland		Bonanza or Rangely 345-kV Mountain Green to Ben Lomond Substation	
Vegetation														
Cultivated	[a]10.1	[b]20.0	[a]24.5	[b]49.0	[a]6.0	[b]12.0	[a]10.0	[b]20.0	[a]24.5	[b]49.0	[a]6.0	[b]12.0	[a]N/A	[b]N/A
Cold Desert Shrub	97.3	194.6	86.1	172.2	101.7	203.4	107.7	215.4	95.9	191.8	120.8	241.6	12.5	25.0
Forest	40.0	320.0	25.0	200.0	25.0	200.0	41.0	328.0	26.0	208.0	25.0	200.0	5.0	40.0
Mountain Brush	10.0	40.0	25.9	51.8	25.9	51.8	15.0	60.0	30.9	123.6	28.8	115.2	6.5	26.0
Pinyon-Juniper	24.6	49.2	23.1	46.2	23.5	47.0	37.0	74.0	38.0	76.0	38.5	77.0	N/A	N/A
Wetland	12.0	48.0	N/A	N/A	N/A	N/A	12.0	48.0	N/A	N/A	N/A	N/A	N/A	N/A
Threatened and Endangered	17.0	68.0	9.5	38.0	40.0	16.0	12.0	48.0	8.5	34.0	38.5	154.0	N/A	N/A
Riparian (No. of Crossings)	5.0	20.0	6.0	24.0	7.0	28.0	5.0	20.0	4.0	16.0	14.0	56.0	3.0	12.0
		759.8		633.0		702.0		813.4		698.2		855.8		103.0
Erosion Hazard														
Slight	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.0	10.0
Moderate	78.4	313.6	122.6	490.4	120.1	480.4	107.2	428.8	153.3	613.2	157.1	628.4	17.0	68.8
Severe	103.5	828.0	62.0	496.0	62.0	496.0	103.5	828.0	62.0	496.0	62.0	496.0	2.0	16.0
		1,141.6		986.4		976.4		1,256.8		1,109.2		1,124.4		94.0
Visual Resources														
Retention	24.0	288.0	14.5	17.4	2.0	24.0	24.0	288.0	14.5	17.4	5.5	66.0	3.0	36.0
Partial Retention	88.5	231.0	61.5	369.0	67.5	405.0	53.5	321.0	76.5	459.0	70.0	420.8	N/A	N/A
Modification and Maximum Modification	119.4	358.2	108.6	325.8	112.6	337.8	133.2	399.6	124.3	372.9	143.6	430.8	21.0	63.0
		877.2		868.8		766.8		1,008.6		1,005.9		916.8		99.0
Land Use														
ORV Closures	12.0	36.0	N/A	N/A	N/A	N/A	12.0	36.0	N/A	N/A	N/A	N/A	N/A	N/A
Scenic Highways (No.)	1.0	12.0	N/A	N/A	N/A	N/A	1.0	12.0	1.0	12.0	N/A	N/A	N/A	N/A
Developed Recreation Sites (No.)	3.0	36.0	5.0	60.0	3.0	36.0	3.0	36.0	4.0	48.0	3.0	36.0	N/A	N/A
Urban Development	6.0	72.0	N/A	N/A	N/A	N/A	6.0	72.0	N/A	N/A	4.0	48.0	19.0	228.0
Commercial Timber	29.5	88.5	N/A	N/A	N/A	N/A	29.5	88.5	N/A	N/A	7.0	21.0	N/A	N/A
		244.5		60.0		36.0		244.5		60.0		105.0		228.0
Wildlife														
Critical Habitat														
Big Game														
Winter Range (moose, elk, and deer)	65.7	262.8	94.4	317.6	83.8	335.2	65.7	262.8	115.8	463.2	88.4	353.6	8.0	32.0
Fawning Range (antelope)	4.0	32.0	4.0	32.0	4.0	32.0	N/A	N/A	N/A	N/A	4.0	32.0	N/A	N/A
Sage Grouse														
Concentration Areas	38.0	152.0	65.0	260.0	64.0	256.0	48.0	192.0	74.5	298.0	79.5	318.0	N/A	N/A
Waterfowl Habitat	27.0	108.0	18.5	74.0	27.5	110.0	27.0	108.0	19.4	77.6	37.5	150.0	N/A	N/A
Raptor														
Nesting Area (golden eagle)	N/A	N/A	5.0	20.0	5.0	20.0	N/A	N/A	5.0	20.0	5.0	20.0	N/A	N/A
Migration Route (Weber River)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.0	20.0	5.0	20.0
Threatened and Endangered	1.0	8.0	5.0	40.0	14.0	112.0	1.0	8.0	5.0	40.0	4.0	192.0	N/A	N/A
Wild Horses	N/A	N/A	N/A	N/A	42.5	170.0	16.0	64.0	16.0	64.0	46.5	186.0	N/A	N/A
		562.8		803.6		1,035.2		634.0		962.8		1,271.6		52.0
Fish														
T&E Habitat	1.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0	4.0	4.0	N/A	N/A
Critical Aquatic Habitat	4.0	8.0	4.0	8.0	4.0	8.0	4.0	8.0	4.0	8.0	4.0	8.0	2.0	4.0
High Priority Trout Habitat	4.0	8.0	5.0	10.0	5.0	10.0	4.0	8.0	5.0	10.0	5.0	10.0	5.0	10.0
Substantial Trout Habitat	2.0	2.0	10.0	10.0	9.0	9.0	2.0	2.0	10.0	10.0	9.0	9.0	N/A	N/A
		19.0		29.0		29.0		19.0		30.0		31.0		14.0
Cultural Resources														
High	N/A	N/A	N/A	N/A	N/A	N/A	2.0	16.0	2.0	16.0	N/A	N/A	N/A	N/A
Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Low	2.0	4.0	N/A	N/A	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	N/A	N/A
		4.0				2.0		18.0		18.0		2.0		
Total Determination Score for Alternative		3,607.9		3,380.8		3,547.4		3,994.3		3,884.1		4,306.6		590.0

[a]Miles of resource along alternative route (Those resources where the quantitive measure is by numbers or sites is so indicated).

[b]Determinate Score.
Determinate score is derived by the following formula:
Miles (or Nos. of sites) of Resource X Data Item Impact Weights X Determinate Weights = Determinate Score
Refer to Table C for data item impact weights and determinate weights.

TABLE G

Transmission System
Bonanza Unit 2 Routing Alternatives

Resource Data Items	Derivation of Determinate Scores by Routing Alternative	
	Mona to Ben Lomond Alternative	
Vegetation		
Cultivated	[a]78.7	[b]157.4
Cold Desert Shrub	21.5	43.0
Forest	N/A	N/A
Mountain Brush	N/A	N/A
Pinyon-Juniper	3.0	6.0
Wetland	N/A	N/A
Threatened and Endangered	10.5	42.0
Riparian (No. of crossings)	N/A	N/A
		248.4
Erosion Hazard		
Slight	59.7	119.4
Moderate	40.0	160.0
Severe	14.0	112.0
		391.4
Visual Resources		
Retention	N/A	N/A
Partial Retention	N/A	N/A
Modification and Maximum Modification	113.7	341.1
		341.1
Land Use		
ORV Closures	N/A	N/A
Scenic Highways	N/A	N/A
Developed Recreation Sites	N/A	N/A
Urban Development	43.7	524.4
Commercial Timber	N/A	N/A
		524.4
Wildlife		
Critical Habitat		
Big Game		
Winter Range (moose, elk, and deer)	7.0	28.0
Fawning Range (antelope)	7.0	56.0
Sage Grouse		
Concentration Areas	N/A	N/A
Waterfowl Habitat	15.0	60.0
Raptor		
Nesting Area (golden eagle)	N/A	N/A
Migration Route (Weber River)	N/A	N/A

(continued)

APPENDIX 12, TABLE G (concluded)

Resource Data Items	Derivation of Determinate Scores by Routing Alternative — Mona to Ben Lomond Alternative	
Threatened and Endangered	N/A	N/A
Wild Horses	N/A	N/A
		144.0
Fish (No. of Crossings)		
T&E Habitat	N/A	N/A
Critical Aquatic Habitat	N/A	N/A
High Priority Trout Habitat	N/A	N/A
Substantial Trout Habitat	5.0	5.0
		5.0
Cultural Resources		
High	N/A	N/A
Medium	N/A	N/A
Low	N/A	N/A
Total Determinate Score for Alternative		1,654.3

[a]Miles of resource along alternative route (Those resources where the quantitive measure is by numbers or sites is so indicated).

[b]Determinate Score
Determinate score is derived by the following formula:
Miles (or Nos. of sites) of Resource X Data Item Impact Weights X Determinate Weights = Determinate Score.

Refer to Table C for data item impact weights and determinate weights.

APPENDIX 12 (continued)

TABLE H

Alternative Analysis and Evaluation
Unit 1 Routing Alternatives

Alternatives	Miles	Determinates: Vegetation	Erosion Hazard	Visual Resources	Land Use	Wildlife	Fish	Cultural	Total Impact Score	Total Score Percent Difference From Applicant's Proposal	Impact Score Per Mile	Per Mile Score Percent Difference From Applicant's Proposal	Score Adjustment for Paralleling Existing R/W	Adjusted Impact Score	Adjusted Score Percent Difference From Applicant's Proposal	Adjusted Impact Score Per Mile	Adjusted Per Mile Impact Score Difference From Applicant's Proposal
BONANZA UNIT 1 ROUTING ALTERNATIVES																	
Bonanza to Tank Hollow 345-138 kV via																	
Upalco-Fruitland[a]	121.7	375	667	537	60	400	5	--	2,044	0	16.8	0	-66	1,978	0	16.3	0
Upalco-Sowers	131.7	423	755	490	12	364	5	--	2,048	+0.2	15.6	-7.1	-63	1,985	+0.4	15.1	-7.4
Castle Pk-Sowers	139.7	515	787	529	--	810	6	--	2,647	+22.8	18.9	+11.4	-46	2,601	+24.0	18.6	+12.5
Castle Pk-Fruitland	131.7	524	707	515	36	662	7	2	2,453	+16.7	16.6	+9.9	-24	2,429	+18.6	18.4	+11.4
Tank Hollow to Mona 345 kV via																	
Dairy Fork[a]	49.6	173	390	187	12	168	2	4	936	0	18.9	0	-47	889	0	17.9	0
Thistle Canyon	50.1	156	401	211	12	177	4	4	965	+3.0	19.3	+2.0	-67	898	+1.0	17.9	0
Utah Valley	41.1	155	329	348	72	119	5	--	1,028	+8.9	25.0	+24.4	-38	990	+10.2	24.1	+25.7
Bonanza or Rangely Site Price Canyon-Water Hollow 345-kV via																	
Eccles Canyon	39.5	126	316	229	41	68	9	--	789	-31.2	20.0	-4.8	0	789	-30.0	20.0	-3.4
Sowers Canyon-Dairy Fork[a]	54.5	173	436	236	0	275	6	--	1,146	0	21.0	0	-19	1,127	0	20.7	0
Sowers Canyon-Thistle Canyon	55.0	159	440	330	0	319	5	--	1,253	+8.5	22.8	+7.8	-39	1,241	+9.2	22.1	+6.3
Bonanza 138 kV via																	
Bonanza-Vernal[b]	25.5	83	102	86	--	44	1	--	316	0	12.4	0	-19	297	0	11.6	0
Bonanza-Rangely via Little Bonanza[a]	23.7	84	95	53	--	69	1	2	303	0	12.7	0	-16	287	0	12.1	0
Bonanza-Rangely via Mellon Hill[c]	25.7	63	103	95	36	40	1	--	338	+10.4	13.2	+3.4	-13	325	+11.7	12.6	+4.3
RANGELY UNIT 1 ROUTING ALTERNATIVES																	
Rangely to Tank Hollow 345-138 kV via																	
Upalco-Fruitland[d]	143.5	440	790	684	60	557	8	6	2,545	0	17.7	0	-89	2,456	0	17.1	0
Upalco-Sowers	153.5	500	878	591	12	533	6	18	2,538	-0.3	16.5	-6.8	-86	2,452	-0.2	16.0	-6.4
Castle Pk-Sowers	176.7	645	932	676	48	1,084	8	2	3,395	+25.0	19.2	+7.9	-74	3,321	+26.0	18.8	+9.0
Castle Pk-Fruitland	168.7	692	851	665	84	904	4	2	3,202	+20.5	19.0	+6.7	-52	3,150	+22.0	18.7	+8.4
Rangely 138 kV via																	
Rangely-Vernal[e]	54.3	133	217	181	--	196	1	18	746	0	13.7	0	-34	712	0	13.1	0
Rangely-Rangely Substation[e]	15.5	43	62	65	76	170	1	--	416	0	26.8	0	-13	403	0	26.0	0

[a]Applicant's proposal with Bonanza as plant site.

[b]This route would be necessary under any alternative with Bonanza as the plant site.

[c]Bonanza to Rangely via Mellon Hill is compared to Bonanza to Rangely via Little Bonanza.

[d]Applicant's proposal with Rangely as plant site.

[e]This route would be necessary under any alternative with Rangely as plant site.

TABLE I

Alternative Analysis and Evaluation
Unit 2 Routing Alternatives

Alternatives	Miles	Determinates: Vegetation	Erosion Hazard	Visual Resources	Land Use	Wildlife	Fish	Cultural	Total Impact Score	Total Score Percent Difference From Applicant's Proposal	Impact Score Per Mile	Per Mile Score Percent Difference From Applicant's Proposal	Score Adjustment for Paralleling Existing R/W
BONANZA UNIT 2 ROUTING ALTERNATIVES													
Bonanza to Mountain Green 345 kV via													
Lone Tree[a]	181.9	760	1,142	877	245	563	19	4	3,608	0	19.8	0	-29
Upalco-Fruitland	184.6	633	986	869	60	804	29	--	3,381	-6.3	18.3	-7.5	-101
Castle Pk-Fruitland	182.1	702	976	767	36	1,035	29	2	3,547	-1.7	19.5	-1.6	-59
RANGELY UNIT 2 ROUTING ALTERNATIVES													
Rangely to Mountain Green 345 kV via													
Lone Tree[b]	210.7	813	1,257	1,009	245	634	19	18	3,994	0	19.0	0	-45
Upalco-Fruitland	215.3	698	1,109	1,006	60	963	30	18	3,884	-2.8	18.4	-5.1	-124
Castle Pk-Fruitland	219.1	856	1,124	917	105	1,272	31	2	4,307	+7.3	19.7	+3.3	-77
Bonanza or Rangely 345 kV via[c]													
Mountain Green to Ben Lomond S.	24.0	103	94	99	228	52	14	--	590	0	24.5	0	-58
BONANZA OR RANGELY UNIT 2 ROUTING ALTERNATIVE													
Unit 2 345 kV[d]													
Mona to Ben Lomond S.	113.7	248	391	500	524	144	5	--	1,654	0	14.5	0	-273

[a]Applicant's proposal with Bonanza as plant site.

[b]Applicant's proposal with Rangely as plant site.

[c]Impact scores and adjustments apply and will be added to impact score and adjustments for both Bonanza and Rangely Unit 2 routing alternatives.

[d]Mona to Ben Lomond impact scores are to be compared to total adjusted scores for Bonanza or Rangely Unit 2 route scores.

TABLE J

The "Parallel Advantage" Determinate
Existing Corridors Paralleled
(Data Items)[a]

	<138-kV[c]				>230-kV[d]			
Determinate[b]	138-kV		138-kV+		230-kV		230-kV+	
Vegetation (2)	2	(4)	2	(4)	2	(4)	2	(4)
Erosion Hazard (2)	1	(2)	1	(2)	1	(2)	1	(2)
Visual Resources (3)	1	(3)	2	(6)	2	(6)	4	(12)
Land Uses (3)	-2	(-6)	-2	(-6)	-2	(-6)	-2	(-6)
Wildlife (2)	1	(2)	2	(4)	1	(1)	2	(4)
Fish (1)	1	(1)	1	(1)	1	(1)	1	(1)
		(6)		(11)		(8)		(17)
Weighted		0.9		1.6		1.1		2.4

[a]Left column shows data item values: 1 = slightly advantageous, 2 = moderately advantageous, or 4 = highly advantageous. Right column (in parentheses) shows weighted ratings: Determinate Values X Data Item value.

[b]Includes only determinates that would benefit by paralleling existing rights-of-way. Determinate weights are in parentheses.

[c]<138-kV = Line size up to and including 138-kV.
138-kV = One line only; 138-kV + = one or more 138-kV line plus 1 or more smaller lines.

[d]>230-kV = Line size equal to or greater than 230-kV.
230-kV = line line only; 230-kV+ = one or more 230-kV lines plus/or more larger or smaller lines.

TABLE K

Adjustment for Paralleling Existing Powerlines
Unit 1 Routing Alternatives

Alternatives	Length Miles	<138-kV 138-kV (0.9)[a]	138-kV+ (1.6)[a]	>230-kV 230-kV (1.1)[a]	230-kV+ (2.4)[a]	Total Adjustment Scores
BONANZA UNIT 1 ROUTING ALTERNATIVES						
Bonanza-Tank Hollow 345- 138-kV via						
Upalco-Fruitland	41.5	--	41.5/-66	--	--	-66
Upalco-Sowers	54.5	42.5/-38	4.0/-6	--	8.0/-19	-63
Castle Pk-Sowers	38.0	30.0/-27	--	--	8.0/-19	-46
Castle Pk-Fruitland	15.0	--	15.0/-24	--	--	-24
Tank Hollow to Mona via						
Dairy Fork	19.7	--	--	--	19.7/-47	-47
Thistle Canyon	27.9	--	--	--	27.9/-67	-67
Utah Valley	15.7	--	--	--	15.7/-38	-38
Price Canyon to Water Hollow via						
Eccles Canyon	0.0	0/0	0/0	0/0	0/0	0
Sowers-Dairy Fork	8.0	--	--	--	8.0/19	19
Sowers-Thistle	16.2	--	--	--	6.2/39	39
Bonanza to Vernal 138-kV	21.3	21.3/-19	--	--	--	-19
Bonanza to Rangely 138-kV via						
Little Bonanza	17.5	17.5/-16	--	--	--	-16
Mellon Hill	8.0	--	8.0/-13	--	--	-13
RANGELY UNIT 1 ROUTING ALTERNATIVES						
Rangely to Tank Hollow 345- 138-kV via						
Upalco-Fruitland	66.5	25.0/-23	41.5/-66	--	--	-89
Upalco-Sowers	79.5	67.5/-61	4.0/-6	--	8.0/-19	-86
Castle Pk.-Sowers	69.5	61.5/-55	--	--	8.0/-19	-74
Castle Pk.-Fruitland	46.5	31.5/-28	15.0/-24	--	--	-52
Rangely to Vernal Sub. 138-kV	38.3	38.3/-34	--	--	--	-34
Rangely to Rangely Sub.	14.0	14.0/-13	--	--	--	-13

[a]The parallel advantage weight is multiplied by the number of miles (first number) to give the score adjustment value (second number) (see table J).

APPENDIX 12 (continued)

TABLE L

Adjustment for Paralleling Existing Powerlines
Unit 2 Routing Alternatives

Alternatives	Length Miles	<138-kV 138-kV (0.9)[a]	138-kV+ (1.6)[a]	>230-kV 230-kV (1.1)[a]	230-kV+ (2.4)[a]	Total Adjustment Scores
BONANZA UNIT 2 ROUTING ALTERNATIVES						
Bonanza-Mt. Green via						
Lone Tree	30.0	17.0/-15	--	13.0/-14	--	-29
Upalco-Fruitland	66.5	--	56.5/-90	10.0/-11	--	-101
Castle Pk-Fruitland	40.0	--	30.0/-48	10.0/-11	--	-59
RANGELY UNIT 2 ROUTING ALTERNATIVES						
Rangely to Mt. Green via						
Lone Tree	47.0	34.0/-31	--	13.0/-14	--	-45
Upalco-Fruitland	91.5	25.0/-23	56.5/-90	10.0/-11	--	-124
Castle Pk.-Fruitland	71.5	46.5/-42	15.0/-24	10.0/-11	--	-77
Mt. Green to Ben Lomond[b]	24.0	--	--	--	24.0/-58	-58
Mona to Ben Lomond	113.7	--	--	--	113.7/-273	-273

[a] The parallel advantage weight is multiplied by the number of miles (first number) to give the score adjustment value (second number) (see table J).

[b] Mt. Green to Ben Lomond adjustments apply and will be added to both Bonanza and Rangely Unit 2 Alternatives.

SECTION B. IMPACT RATING SYSTEM FOR TRANSMISSION LINES

Determinates

Determinates are major categories of resources considered to be subject to potential impacts resulting from the construction, operation, and maintenance of the project. The list of determinates is limited to those resource categories which the EIS team felt could be significantly impacted. Determinates are composed of one or more data items.

All of the resource categories listed as determinates are considered to be important and have a reasonable potential to be impacted. They are not equally important or sensitive to impact. Thus, the determinates were weighted relative to each other by using the values of 1, 2, and 3. A determinate with a weight of 3 had more ultimate influence on total impact scores than a determinate with a weight of 2, and a weight of 2 was more influential than a weight of 1.

The EIS team used professional judgment to assign determinate weights. Special attention was given to resource categories which are considered to be important by various publics, although such public opinion of resource importance was tempered by the team's evaluation of impact potential. The impact analysis was based on the assumption that common construction techniques would be used, including road access to the right-of-way, so that ground equipment could be used in clearing vegetation, constructing towers, stringing the conductors, etc.

A list of the determinates used for analysis purposes and their relative importance weights follows:

Determinate Weights[a]

	Transmission Lines
Vegetation	2
Erosion Hazard	2
Visual Resources	3
Land Use	3
Wildlife	2
Fish	1
Cultural Resources	2

[a]These weights reflect the EIS team's interdisciplinary assessment of the relative importance of the resources encountered along the alternate transmission route.

DATA ITEMS

Each data item represents an individual resource or some facet of a resource within the study area which is likely to be influenced by the project. The list of data items was restricted to those resources which were

considered to be significant within the study area, excluding those resources which would have only a very remote chance of being impacted. Data items used for analysis include:

Transmission Line Data Items

Vegetation
- Cultivated
- Cold Desert Shrub
- Forest
- Mountain Brush
- Pinyon-Juniper
- Wetland
- Riparian Crossings
- Threatened and Endangered Species

Erosion Hazard
- Slight
- Moderate
- Severe

Visual Resources
- Retention
- Partial Retention
- Modification
- Maximum Modification

Land Use
- ORV Closures
- Scenic Highways
- Developed Recreation Sites
- Urban Development
- Commercial Timber

Wildlife
- Critical Habitat
  - Big Game
    - Winter Range (moose, elk, and deer)
    - Fawning Range (antelope)
  - Sage Grouse Concentration Areas
  - Waterfowl Habitat
  - Raptors
    - Nesting Area (golden eagle)
    - Migration Route (Weber River)
  - Threatened and Endangered Species
  - Wild Horses
  - Fish
    - Threatened and Endangered Habitat
    - Critical Aquatic Habitat
    - High Priority Trout Habitat
    - Substantial Trout Habitat

Cultural Resources
- High
- Medium
- Low

Determinates and Data Items

The following discussion deals with the composition and value of data items and the importance weighting for each determinate.

Vegetation

Composition and Value of Data Items

The vegetation determinate is comprised of broad vegetation types and threatened and endangered plant species habitat. The types are: cultivated, cold desert shrub, forest, mountain brush, pinyon-juniper, and riparian/wetland. Vegetation impact potentials were rated high (4), moderate (2), and low (1). Forest was rated high (4) because of the sustained impact of clearing and cutting timber for powerline clearance. Mountain brush, riparian/wetland, and threatened and endangered plant habitats were rated moderate (2). This rating was given to mountain brush and riparian/wetland because there would only be the initial impact of powerline construction, and the recovery potential of these types is very high and would take a relatively short period of time. Furthermore, most riparian areas would be spanned which would preclude any substantial adverse disturbance. Threatened and endangered plant species habitat was rated moderate because any adverse impacts would be mitigated by identifying populations, then avoiding, spanning, or otherwise limiting or eliminating the impact. Cultivated, cold desert shrub, and pinyon-juniper habitats were rated low (1). Cultivated land would only be affected for the duration of the construction activities with no impairment to production that would last beyond one growing season. Cold desert and pinyon-juniper habitats were given a low rating because of their intermountain-wide distribution, limited productivity, and mitigation which calls for reseeding disturbed areas with desirable plant species.

Determinate Value

The vegetation determinate was given an overall weighting of 2 (on a 1-3 scale) relative to other determinates. This is because vegetation is a primary resource that, when impacted, affects all other resources. There would be low to moderate probability of adverse impact to vegetation from project construction.

Erosion Hazard

Composition and Value of Data Items

Erosion hazards were rated as high (4), moderate (2), and low (1) to correspond with the standard Soil Conservation Service ratings of severe, moderate, and slight. Soils with a severe erosion hazard are more erodable

and occur on steeper slopes where temporary disturbance could result in loss of soil. In addition, they are often difficult to reclaim and are therefore given a potential impact rating of 4. Soils of moderate and low erosion hazard are subsequently less susceptible to impact from project construction and maintenance and are rated 2 and 1 respectively.

Determinate Value

The erosion hazard determinate was given an overall weighting of 2 (on a 1-3 scale) relative to other determinates. This reflects a moderate to high relationship of soil erosion to impacts on other resources such as vegetation and water resources and low to moderate probability of adverse impact from isolated disturbance at tower sites, along access roads, etc.

Visual Resources

Composition and Value of Data Items

The types of activities allowed to take place in an area are reflected in the Visual Resource Management Classes. There are four different management classes which the proposed transmission routes pass through: Retention (Class II), Partial Retention (Class III), Modification, and Maximum Modification (Classes IV and V combined).

The management classes are determined by scenic quality, distance zone, user volume, user attitude, and sensitivity to change. (These terms are explained in Appendix 16).

The Retention Class was rated high (4) due to its high scenic quality, high sensitivity, and/or foreground distance zone.

The Modification and Maximum Modification Classes are the least restrictive and are rated low (1) due to their low scenic quality, low sensitivity, and/or background or seldom seen distance zone.

The Partial Retention Class is rated moderate (2) because it falls between the other two classes in all criteria.

Determinate Value

Visual resources were given an overall rating of 3, the highest possible. This reflects a high public interest in disturbances to scenery and a high probability of adverse impact along travel routes.

Land Use

Composition and Value of Data Items

The land use determinate is comprised of ORV closures, scenic highways, developed recreation sites, urban development, and commercial timber. Land use impact potentials were rated high (4) and low (1). ORV closures were rated low (1) because impacts associated with transmission line construction would be temporary and allowable under special use permits. Scenic highways and developed recreation sites were rated high (4) due to high public concern, intensive public use, and high probability of adverse impact. Urban development includes high intensity cultural landscape such as residential tracts and

business, commercial, or industrial zones. A high impact (4) rating was assigned to urban development because of the serious conflict between it and a public utility corridor. Commercial timber was assigned a low (1) impact rating because of the general inaccessibility of the timber and insignificant volume that could be impacted in comparison to the overall regional resource available.

Determinate Value

The land use determinate was given an overall weighting of 3 (on a 1-3 scale) relative to other determinates. This reflects a high probability of adverse impacts due to the high sensitivity of land use conflicts.

Wildlife

Composition and Value of Data Items

The wildlife determinate is comprised of critical habitat for big game (deer, elk, and moose); antelope fawning area; critical habitat for sage grouse, waterfowl, turkey, sharptailed grouse, golden eagle nesting areas, a unique raptor migration route, wild horses, and threatened and endangered habitat for bald eagles and whooping cranes. Wildlife ratings were rated high (4), and moderate (2). Endangered species habitat and antelope fawning areas were rated high (4) because of the protection afforded threatened and endangered species by the Endangered Species Act, and the potential for fawn loss from disturbance during critical fawning periods. All other categories were given a moderate (2) rating because of the ability of the animal to adapt to the situations imposed by the construction activities, the short-term effects of the probable impacts, the mobility of most of the species, or the probable mitigation measures imposed. If sage grouse strutting ground is subsequently identified in a proposed corridor or in close proximity to one (within 0.25 mile), a high rating (4) should be imposed on a specific case-by-case basis.

Determinate Value

The wildlife determinate was given an overall weighting of 2 (on a 1-3 scale) relative to other determinates. This reflects a moderate to high public interest in wildlife and low to moderate probability, in most instances, of adverse impact.

Fish

Composition and Value of Data Items

The fish determinate is comprised of threatened and endangered species habitat, critical aquatic habitat, high priority trout habitat, and substantial trout habitat. Threatened and endangered habitat was rated low (1). Increased turbidity would not likely impact the threatened and endangered species found in the Green and White Rivers. Critical aquatic habitat was rated medium (2) because of spawning habitat that could be impacted. High priority trout habitat was rated medium (2), and substantial trout habitat was rated low (1) based on three criteria--aesthetics, availability, and productivity.

Determinate Values

The fish determinate was given an overall weighting of 1 (on a 1-3 scale) relative to other determinates. This reflects a somewhat important interest in this resource because of the kind of impacts and the low probability of severe adverse impacts due to stream crossings of powerlines.

Cultural Resources

Composition and Value of Data Items

A stratification of sites into high (4) and low (1) sensitivity groups was made to reflect different impact potentials rated to the various sites. Sites were divided into these two groups by assessing their potential for being impacted by project construction, maintenance, and operation. Those sites which are most difficult to salvage without loss of value and are listed in or eligible to the National Register of Historic Places were rated high (4). Those sites which are definitely not eligible to the National Register and have no research potential were rated low (1).

Determinate Values

The cultural resource determinate was given a value of 2 on a scale of 1 to 3. This recognizes a compromise between the relatively high importance given this resource by a select group of professional and nonprofessional people and the lower importance placed on this resource by various publics. Additionally, many prehistoric and historic sites can be salvaged or avoided with correct mitigating measures, with the potential impact being reduced or eliminated, which also justifies the determinate value of 2.

Derivation of Impact Scores

Derivation of the impact score for each resource (determinate) can be visualized as a multiplicative combination of distance, seriousness of potential impacts, and importance of that resource impact. The following equations summarize the above process to calculate impact scores:

$$(\text{Distance of Impact Effect}) \times \left(\begin{array}{c}\text{Seriousness of}\\ \text{Impact}\end{array}\right) \times \left(\begin{array}{c}\text{Importance of}\\ \text{Resource Impact}\end{array}\right)$$

Equals = Resource Impact Score.

The sum of all impact scores for the alternative is the total impact score. See tables D to G for resource impact scores.

Adjustments for Paralleling Existing Powerlines

An adjustment of impact scores was made to account for the existence of powerlines along portions of certain corridor segments (see table 2-12, Chapter 2 for the distribution of existing rights-of-way in the study area). This was entered into the analysis as an additional determinate referred to as the Parallel Advantage Determinate. This adjustment was made to account for the

generally lower impacts resulting from paralleling existing rights-of-way as opposed to crossing environments not interrupted by powerlines.

The Parallel Advantage determinate is composed of four data items, each consisting of certain numbers and sizes of powerlines. Each of these data items was evaluated for the advantage (reduction of impact potential) it represents to the various resource determinates. Resources in six of the seven determinates were thought to benefit significantly from paralleling an existing line, so not all determinates are represented. The advantage of paralleling existing powerlines was rated as 1 (slightly advantageous), 2 (moderately advantageous), or 4 (highly advantageous) for each of the resource determinates.

Data Item Values

Vegetation

The data item value for vegetation was assigned as moderately advantageous (2) for all four data items. Disturbance to existing vegetation cover from the addition of new lines in an existing right-of-way would be mainly related to the construction of new access roads; this assumption would apply regardless of the number and size of existing lines. Access roads needed for line construction would cause the major impacts to vegetation cover. Clearing vegetation for tower sites and conductor clearance would be minimal and therefore would be considered a minimal impact; such clearing is not considered in assigning data item values. Existing access roads associated with existing rights-of-way are considered as moderately advantageous to a vegetation resource; some new access roads would be needed but not as many miles as would be needed with a new right-of-way.

Erosion Hazard

The data item value for erosion hazard was assigned as slightly advantageous (1) for all four data items. As with vegetation, erosion impacts would be mainly related to the construction of new access roads. It is assumed that erosion impacts have been mitigated along existing right-of-way access roads. Utilization of these existing access roads would decrease the miles of new access roads needed for additional lines and therefore decrease erosion impacts. There would still be erosion impacts associated with new access roads and utilization of an existing right-of-way is considered only slightly advantageous.

Visual Resources

The data item values for visual resources were assigned as slightly (1), moderately (2), and highly advantageous (4), depending on the number and size of existing lines and their associated rights-of-way. The values applied assume that the greater the visual impact of existing transmission lines, the smaller the added impact of new lines. Thus, paralleling several lines and towers of similar or larger size is considered as visually highly advantageous as compared to the visual impacts resulting from establishing a new right-of-way and constructing a transmission system. A moderate advantage would result from paralleling one smaller line and associated towers of similar or larger

size or several smaller lines and associated towers. A slight advantage would result from paralleling the smaller line and associated towers.

Land Uses

The only land uses associated with existing transmission line rights-of-way are Developed Recreation Sites and Urban Development. Increasing the right-of -way widths to accommodate additional lines would cause additional adverse social and economic impacts to the land use values adjacent to the right-of-way. Social and economic pressures suggest establishing alternative routes outside of these land uses. A negative value was assigned to all data items; the negative value represents a moderately disadvantageous value and applies to all existing rights-of-way and the associated transmission lines.

Wildlife

Slightly (1) and moderately (2) advantageous values were assigned to existing rights-of-way. It is assumed that wildlife species are conditioned with time to the effects of transmission systems on their habitat. When a new line is added to an existing right-of-way containing several lines, the conditioning time is shorter than that conditioning time involved with either a new right-of-way and associated new lines or adding a line to an existing right-of-way containing only one line. Therefore, a slightly advantageous (1) value was assigned to rights-of-way containing one line and a moderately advantageous (2) value was assigned to rights-of-way containing more than one line.

Fish

Limiting access roads across or adjacent to streams providing aquatic habitat safeguards the values of the habitat. As explained under Vegetation and Erosion Hazard, fewer access roads would be required with the utilization of existing rights-of-way than with the establishment of new rights-of-way. Therefore, with fewer roads, the impact to the aquatic habitat would be less than that occurring with establishment of a new right-of-way and new access roads. A slightly advantageous (1) value was assigned to all data items. The number of access roads is not dependent on the size of the transmission lines.

Ratings for all affected resources were multiplied by the determinate value to obtain a weighted rating for each determinate. The sums of all weighted ratings for all determinates were divided by the number of determinates involved to yield mean weighted data item values. These values are given in the bottom line of table J.

To adjust impact scores, each mean weighted data item value was multiplied by the number of miles of that type of line paralleled along each of the alternative transmission line routes. Each resultant data item score was summed for all line types to provide a determinate score. These values are shown in table K. The determinate score for each alternative was subtracted from the total score for that alternative, yielding reduced alternative impact scores which reflect the influence of parallel existing lines.

Summary of Adjustment Process for Paralleled Powerlines

The following equations summarize the above adjustment process for paralleled lines:

1. $$[\text{Data Item Value}] \times [\text{Determinate Value}] = \text{Weighted Determinate Value}$$

2. $$\begin{bmatrix}\text{Sum of Weighted}\\ \text{Determinate Values}\end{bmatrix} \div \begin{bmatrix}\text{Number of}\\ \text{Determinates}\end{bmatrix} = \text{Mean Weighted Data Item Values}$$

3. $$\begin{bmatrix}\text{Mean Weighted Data}\\ \text{Item Value}\end{bmatrix} \times \begin{bmatrix}\text{Miles of Line of}\\ \text{Each Data Item Type}\end{bmatrix} = \begin{bmatrix}\text{Data Item Score for}\\ \text{That Line Type}\end{bmatrix}$$

4. $$\begin{bmatrix}\text{Sum of all Data Item Scores}\\ \text{Across All Line Types}\end{bmatrix} = \text{Determinate Score for Parallel Advantage}$$

5. $$[\text{Total Impact Score}] - \begin{bmatrix}\text{Determinate Score for}\\ \text{Parallel Advantage}\end{bmatrix} = \begin{bmatrix}\text{Adjusted Impact}\\ \text{Score}\end{bmatrix}$$

Data item scores and Parallel Advantage determinate scores for each alternative are presented in tables H and I. Tables of impact scores in this Appendix are shown both with and without adjustments. The adjustments range from 3 to 17 percent of the total unadjusted scores.

APPENDIX 13

Atmospheric Stability Class Definitions

Stability Class	Lapse Rate Centigrade Degrees/100 Meters	Wind Speed (meters per second)[a]
A	Greater than 1.9	≤ 1.0
B	1.7 to 1.9	≤ 2.6
C	1.5 to 1.7	≤ 3.1
D	0.5 to 1.5	All speeds
E	-1.5 to 0.5	≤ 2.6
F	Less than -1.5	≤ 1.5

[a]One meter per second equals 2.2 mph.

The lapse rate is defined as the rate of decrease of temperature in the atmosphere with height. Thus, a positive lapse rate indicates a decrease in temperature with height, while a negative lapse rate indicates an increase in temperature with height.

If a temperature lapse rate indicated a particular stability class but the wind speed does not meet the criteria for that stability class, then the stability is moved one stability class closer to neutral stability. If the wind speed is greater than 6 knots, the stability is D, or neutral, independent of the lapse rate (Burns and McDonnell, 1980a).

APPENDIX 14

Definition of Paleontological Importance Ratings

Importance ratings are based on the expected degree of required mitigation. Ratings are grouped into four categories:

A. High probability of important fossil occurrence. Important fossils (vertebrate, invertebrate, and/or plant) are found in formations of this category, and any excavation may uncover and destroy them. These areas must be carefully surveyed in detail by a qualified paleontologist before any excavation is done. A qualified paleontologist must be present whenever excavations are made in these formations and allowed to collect samples of any important fossil materials uncovered during excavation.

B. Moderate probability of important fossil occurrence is based on one or more of the following criteria: (1) important fossils have been found in these formations in other areas; (2) there has been little work done in the formations to determine their paleontological potential; (3) the fossils found in these formations are poorly preserved and/or scarce but important when found. These areas should be spot checked before any excavation is done. If important fossils are found during the spot check then these areas would take on the same mitigation requirements as A.

C. Low probability of important fossil occurrence indicates that no field survey would be necessary in these formations unless important fossils are uncovered during excavation. If any vertebrate, invertebrate, or plant fossils are uncovered during excavation, they should be salvaged and immediately turned over to a competent paleontologist to determine their importance.

D. The negligible rating indicates that the rocks are either volcanic, highly metamorphic, or intrusive. Fossils are rarely or never found in rocks of this nature.

APPENDIX 15

Status of Threatened and Endangered Plants

As amended November 10, 1978, the Endangered Species Act mandatorily withdraws proposed species which have not been officially listed within 2 years of the proposal. Candidate species which appeared on lists in 1975 and 1976 were mandatorily dropped from consideration on November 10, 1979. A new list of potentially threatened (T) or endangered (E) plant species has been proposed by the Utah Native Plant Society and is under consideration for publication in the Federal Register (USFWS). The USFWS intends to publish a new list of candidate plant species in the near future, but is continuing to review the plants on on the 1975 and 1976 lists. These plants should continue to be considered in environmental planning (F.R. 44-238, Dec. 10, 1979).

Threatened and Endangered Plants Within the Regional Area of Moon Lake in Colorado, Utah and Wyoming

Plant	Status	State	
Aquilegia barnebyi	E	Colorado	Recommended as E by Smithsonian (1978).
Arabis demissa var. languida	T	Utah	F.R. 1975, recommended as T by Welsh 1978.
Arabis demissa var. russeola	T	Utah and Colorado	F.R. 1975, recommended as T by Welsh 1978.
Artemesia argilosa	E	Colorado	Recommended as E by Smithsonian (1978).
Astragalus chloodes	T	Utah	F.R. 1975, recommended by Welsh as T 1978.
Astragalus detritalis[a]	E T	Colorado Utah	F.R. 1975 and 1976 as E. Recommended by Welsh in Utah as T 1978.
Astragalus duchesnensis[a]	T	Utah	F.R. 1975 recommended by Welsh as T 1978.
Astragalus hamiltonii	T	Utah	F.R. 1975 and 1976 as E. Recommended by Welsh as T 1978.
Astragalus lutosus	T Delist	Colorado Utah	F.R. 1975 as T. Recommended by Welsh to delist in Utah 1978.
Astragalus osterhoutii	E	Colorado	F.R. 1976 E.
Astragalus proimanthus	E	Wyoming	F.R. 1976 E.
Astragalus saurinus[a]	T	Utah	F.R. 1975 E. F.R. 1976 E. Recommended by Welsh as T.
Carex microptera var. crassinervia	T	Colorado	F.R. 1975 T.

(continued)

APPENDIX 15 (continued)

Plant	Status	State	
Cryptantha barnebyi	E	Utah	F.R. 1975 T. Recommended by Welsh as E 1978.
Cryptantha breviflora[a]	Delist	Utah	F.R. 1976 E. Recommended delist by Welsh 1979.
Cryptantha grahamii	T	Utah	F.R. 1975 E. Recommended by Welsh as T.
Cryptantha rollinsii	T	Colorado	Recommended as T.
Cryptantha stricta	T Delist	Colorado Utah	F.R. 1975 T. Recommented by Welsh to delist in Utah 1978.
Cymopterus duchesnensis	T	Utah	F.R. 1975 E. Recommented by Welsh 1978 as T.
Draba exunguiculata	T	Colorado	F.R. 1975 T.
Ephedra viridis	--	Wyoming	Given a status of unique because of limited distribution.
Eriogonum ephedroides[a]	E T	Colorado Utah	F.R. 1975 E. F.R. 1976 E. Recommended by Welsh as T in Utah.
Eriogonum hylophilum	E	Utah	F.R. 1975 E. F.R. 1976 E. Recommended as E by Welsh 1978.
Eriogonum saurinum	T	Utah and Colorado	F.R. 1975 T. Recommended as T by Welsh in Utah 1978.
Eriogonum viridulum[a]	T Delist	Colorado Utah	F.R. 1975 T. Recommended by Welsh 1978 to delist in Utah.
Festuca dasyclada	E	Utah and	F.R. 1975 E. F.R. 1976 E. Recommended by Welsh in Utah as E 1978.
Glaucocarpum suffrutescens	E	Utah	F.R. 1975 E. F.R. 1976 E. Recommended by Welsh as E in Utah 1978.
Hedysarum boreale var. gremiale	T	Utah	Recommended by Welsh as T 1978.
Hermidium alipes var. pallidum[a]	Delist	Utah	Recommended by Welsh to delist 1979.
Lepidium barnebyanum	E	Utah	F.R. 1976 E. F.R. 1978 E. Recommended by Welsh as E 1978.
Lomatium latilobum	T	Utah	Recommended by Welsh as T 1978.

(continued)

APPENDIX 15 (concluded)

Plant	Status	State	
Mertensia viridis var. cana	T	Utah	F.R. 1975 T. Recommended by Welsh as T 1978.
Mertensia viridis var. dilatata	T	Utah	F.R. 1975 T. Recommended by Welsh as T 1978.
Mimulus gemmiparus	E	Colorado	Recommended as E by Smithsonian 1978.
Oxytropis obnapiformis	E Delist	Colorado Utah	F.R. 1975 E. Recommended by Welsh to delist 1978.
Parthenium ligulatum[a]	E Delist	Colorado Utah	F.R. 1976 E.
Penstemon acaulis	T	Utah and Wyoming	F.R. 1975 T. Recommended as T by Welsh in 1978.
Penstemon grahamii[a]	E	Utah	F.R. 1975 E. F.R. 1976 E. Recommend by Welsh as E 1978.
Penstemon yampaensis	--	Colorado	Recommended for Federal Register
Phacelia formosula	E	Colorado	F.R. 1976 E.
Sclerocactus glaucus	E	Utah	F.R. 1975 E. F.R. 1976 E. Recommended by Welsh as E 1978. Officially listed 1979.
Sullivantia purpusii	T	Colorado	F.R. 1975 T.
Thelypodiopsis argillacea	E	Utah	Recommended as E by Welsh 1978.
Townsendia mensana	T	Utah	Recommended as T by Welsh 1978.

Sources: Clark and Dorn, 1979; USDI, Fish and Wildlife Service, 1979; and Eberie, 1980.

[a]Plants also impacted by alternative plant sites and systems.

APPENDIX 16

Definition of Visual Resource Management (VRM) Terms

VISUAL ZONES

Foreground (F): is immediately adjacent to a travel route and up to a distance of 1 mile away.

Middleground (M): varies from approximately 1 mile to 5 miles. The outer boundary is the point where individual vegetation plots no longer have form or texture.

Background (B): is the remaining area which can be seen from a major travel route, to approximately 15 miles. In order to be included within the distance zone, vegetation should be visible at least as patterns of light and dark.

Seldom Seen (S): Areas either beyond the background zone, away from major travel routes or use areas, or seen from low use transportation routes only.

SCENIC QUALITY

Class A: Areas in which land form, water form, and vegetation patterns are of unusual or outstanding visual quality.

Class B: Areas in which features contain variety, but are not outstanding. Areas lack dominating features.

Class C: Areas which have little variety in form, texture, and color.

SENSITIVITY LEVELS

High Sensitivity (H): Public concern for the quality of the visual resource is major.

Medium Sensitivity (M): Public concern for the visual resource is secondary.

Low Sensitivity (L): Public concern for the visual resource is minor.

(Note: Criteria weighed for determining visual sensitivity includes existing and proposed land uses, use levels (ADT), and the concerns of community residents, visitors, and the land administering agency.)

EXISTING CONTRAST

Low (L): Few man-made features evident.

Medium (M): Some man-made features evident but not dominant.

High (H): Man-made features dominate the landscape.

MANAGEMENT CLASSES

Management classes are standards by which the visual resources of an area are managed. The criteria listed are those of the Bureau of Land Management (BLM) and U.S. Forest Service (USFS).

Class I: Only limited management activity is allowed. Any contrast created within the environment must not attract attention. The category is applied to wilderness areas, some natural areas, and similar situations where activities are to be restricted.

Class II: Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. A contrast may be seen but should not attract attention (analogous to USFS Retention class).

Class III: Contrasts to the basic elements (form, line, color, texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape (analogous to USFS Partial Retention class).

Class IV: Contrasts may attract attention and be a dominant feature of the landscape in terms of scale, but must reflect what could be a natural occurrence within the characteristic landscape (analogous to USFS Modification category).

Class V: Change is needed or change may add acceptable visual variety to an area. This class applies to areas where the natural character has been disturbed to a point here rehabilitation is needed to bring it back into character with the surrounding landscape (analogous to USFS Unacceptable Modification category).

APPENDIX 17

Classification of Farmlands

Farmlands of National Importance

PRIME FARMLAND. In general, prime farmlands have adequate and dependable water supply from irrigation (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years, for crops commonly grown); a favorable temperature and growing season; acceptable acidity or alkalinity; acceptable salt and sodium content; and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for long periods of time and they either do not flood frequently or are protected from flooding. Specific criteria used to identify prime farmland can be found in Public Law 95-87 Section 657.5; published in the Federal Register on January 31, 1978.

UNIQUE FARMLAND. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yield of a specific crop, when treated and managed according to acceptable farming methods.

Farmlands of Statewide Importance

This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land is determined by the appropriate Utah and Colorado state agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

Source: Anderson, 1979.

APPENDIX 18

Developed Recreation Sites in the
Secondary Influence Zone Used at or Near Capacity

Sites	Length of Season[a]	Number of Visitors[b]	Visitor Days[b,c]	Percent of Theoretical Capacity[d]
U.S. Forest Service[e,f]				
1. Spirit Lake CG	83	6,100	5,600	29
2. Brown Lake CG	104	100	5,300	44
3. Lucerne Valley CG	153	48,000	58,200	24
4. Kingfisher Island CG	104	3,400	1,500	29
5. Dowd Spring PG	104	5,000	1,000	49
6. Deep Creek CG	104	4,500	4,100	23
7. Red Canyon VC	104	34,400	1,100	21
8. Red Canyon CG	104	3,400	4,200	50
9. Canyon Rim CG	104	9,100	5,800	31
10. Gooseneck CG	104	1,900	1,400	22
11. Green Lakes CG	119	11,200	11,600	35
12. Skull Creek CG	104	4,900	8,500	31
13. Greendale CG	119	3,800	3,200	30
14. Firefighters Memorial CG	119	36,800	39,700	35
15. Deer Run CG	139	10,700	8,100	31
16. Cedar Springs CG	119	14,700	14,000	51
17. Jarvies Canyon CG	104	2,000	1,800	22
18. Mustang Ridge CG	153	35,500	31,600	28
19. Dripping Spring Group CG	104	8,100	8,400	20
20. Little Hole CG	119	24,700	18,500	91

(continued)

Sites	Length of Season[a]	Number of Visitors[b]	Visitor Days[b,c]	Percent of Theoretical Capacity[d]
21. Hades CG	109	6,000	5,400	24
22. Aspen Grove CG	109	12,000	12,500	25
23. Upper Stillwater CG	109	1,000	2,800	21
24. Iron Mine CG	109	2,000	5,200	40
25. Miners Gulch CG	109	1,000	1,300	20
26. Moon Lake CG	109	16,000	25,000	41
27. Moon Lake Overflow CG	62	8,000	17,400	112
28. Swift Creek CG	109	16,000	4,000	28
29. Yellowstone CG	109	2,700	4,000	23
30. Wandin CG	109	500	1,600	21
31. Uinta Canyon CG	109	1,600	7,500	26
32. Pole Creek Lake CG	88	1,200	6,300	40
33. Palisade Park CG	88	4,100	4,300	35
34. Oaks Park CG	137	2,600	3,800	25
35. Iron Springs PG	129	9,000	2,200	23
36. East Park CG	88	20,300	5,300	28
37. Red Springs CG	129	16,300	5,500	28
38. Lodgepole CG	109	18,000	11,800	31
39. Rifle Mountain Park CG	184	14,300	NA	33
40. Rifle Mountain Park PG	184	2,800	NA	21
41. Three Forks CG	170	2,300	NA	23
42. Meadow Lake CG	153	9,000	NA	27
43. Cliffs Lakes CG	144	2,000	NA	28

(continued)

Sites	Length of Season[a]	Number of Visitors[b]	Visitor Days[b,c]	Percent of Theoretical Capacity[d]
44. South Fork CG	170	26,000	11,700	40
45. Marvine CG	170	14,200	8,300	27
46. Himes Peak CG	170	11,500	6,000	44
47. Shepherds Rim CG	88	19,900	10,400	70
48. Bucks CG	88	9,700	5,700	65
49. Cutthroat CG	140	17,500	8,900	45
50. Trapline CG	140	12,000	7,400	41

[a]Number of days per year a site can be used (Forest Service sites excepted). The days shown for Forest Service sites show a Managed Season or the period of time the site is managed as per its design. This may be at a full service or reduced service level or, in other words, field services may or may not be available.

[b]Reliability varies considerably depending on method used to obtain data.

[c]A visitor day consists of 12 visitor hours which may be aggregated by one or more persons.

[d]Statistical sampling indicates that sites receiving use that exceeds 40 percent of capacity may show signs of deterioration, require heavy maintenance, and user experience levels diminish from overcrowding.

[e]CG = campground; PG = picnic ground; VC = visitor center.

[f]Sites 1-38 are on Ashley National Forest; sites 39-50 are on White River National Forest.

APPENDIX 19

Resource Categories Along Transmission
System Alternative Routes

SOILS

Soil erosion hazards have been rated as severe, moderate, or slight. These categories follow standard SCS terminology. An especially unstable area is found along 4.5 miles of segment 37 (Eccles Canyon alternative, mileposts 16.5-21).

PALEONTOLOGY

The paleontological importance of geological formations encountered by each corridor alternative have been rated as high, moderate, low, or negligible by the State Paleontologist. Formations rated as high are those where important fossils are found. Those rated as moderate are those where: (1) important fossils have been found in the formation; (2) there is a lack of data on which to base a rating; or (3) fossils are scarce, but important when found. A low rating means a low number of low value fossils. A negligible rating is given to formations where fossils are rarely or never found due to the origin of the rock. (See Appendix 14 for further definition of paleontological importance ratings.)

VEGETATION

The transmission corridors would cross five major vegetation types. Each is a composite of numerous subtypes with widely varying plant composition. The following is a brief description of each major type.

Cold Desert Shrub

This is the most extensive vegetation type in Utah, occurring in areas of low rainfall and characterized by ankle-to-waist high sagebrush, shadscale, and saltbush. In some areas grasses and forbs are abundant and plant specie diversity is high. This vegetation type provides most of the fall-winter and early spring forage for livestock and big game in Utah.

Pinyon-Juniper (Pigmy Forest)

This vegetation type is the second most extensive vegetation type in Utah. As the name implies, pinyon pine and Utah juniper are its primary components. Pinyon-juniper commonly occupies a band between the lower elevation, lower rainfall cold desert shrub and the foothill mountain brush vegetation communities. Some pinyon-juniper stands provide good wildlife habitat. However, as the density of pinyon-juniper increases, plant specie diversity decreases which makes much of this type undesirable as it is of little value to wildlife or livestock.

Forest

This vegetation type is characterized by spruce-fir, quaking aspen, lodgepole, and ponderosa pine. It occurs in dense, unbroken stands and in more open irregularly spaced patches, typically at higher elevations and on

north-facing slopes. It provides much wildlife habitat but relatively little forage for big game or livestock.

Mountain Brush

This is typically middle elevation foothill vegetation, characterized by scrub oak, big tooth and canyon maple, squawbush, bitterbrush, and mountain mahogany. This type provides forage and cover to big game as well as to a wide variety of other wildlife and livestock.

Cultivated

Crops (most commonly small grains and alfalfa) and pasturelands are found in mountain valleys and bottomlands.

Riparian Vegetation

Riparian vegetation occurs along perennial and intermittent streams and along some washes. Riparian vegetation is most commonly composed of cottonwood, willows, birch, woods rose, grasses, rushes, and sedges. Riparian vegetation provides important cover and habitat for fish and wildlife.

Wet Meadow/Marsh

These vegetation types occur along segment 35 as subalpine wet meadow and along segment 36 as wetland marsh.

The vegetation types are similar, as many of the same plant species commonly occur in both. However, the subalpine wet meadows are predominantly low-growing rushes, sedges, and willows, while the lowland marshes are typified by taller reed grass, cat tails, and bull rushes.

These vegetation types are of primary importance for providing food, cover, and habitat for many kinds of wildlife.

Threatened and Endangered Species

Habitat of various threatened and endangered plant species are found along the transmission system corridors as listed below.

Segment 1

Potential threatened and endangered plant species habitat is present along the entire segment. *Sclerocactus glaucus* is the potential occupant.

Segment 2

No potential threatened and endangered plant species habitat is known to occur along this segment.

Segment 3

Astragalus detritalis previously cited as threatened, now recommended for delisted-sensitive non-status and Astragalus duchesnensis, now delisted, occur in the segment. Also found in this segment are Cymopterus duchesnensis previously cited as threatened, now recommended for delisting, Eriogonum ephedroides cited as threatened now recommended for sensitive non-status, and Penstemon grahamii cited and recommended as endangered.

Segment 4

Astragalus detritalis previously cited as threatened, now recommended for delisted-sensitive non-status and Astragalus duchesnensis, now delisted, occur in the segment. Also found in this segment are Cymopterus duchesnensis previously cited as threatened, now recommended for delisting, Eriogonum ephedroides cited as threatened now recommended for sensitive non-status, and Penstemon grahamii cited and recommended as endangered.

Segment 5

Potential threatened or endangered plant species habitat is present from mileposts 0-2 of the segment.

Segment 6

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 7

Potential threatened or endangered plant species habitat occurs along the segment between mileposts 3-6 and mileposts 9-12. Sclerocactus glaucus is the potential occupant.

Segment 8

Potential threatened or endangered plant species habitat occurs along the segment from milepost 3 to the end of the segment.

Segment 9

Potential threatened or endangered plant species habitat occurs from mileposts 0-0.5 of the segment.

Segment 10

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 11

Potential threatened or endangered plant species habitat occurs from mileposts 27-28 along the segment.

Segment 12

Potential threatened or endangered plant species habitat occurs along the segment from mileposts 0-1.5.

Segment 13

Potential threatened or endangered plant species habitat occurs from mileposts 0-32. Potential species known to inhabit the segment are Astragalus duchesnensis, Cymopterus duchesnensis, and Sclerocactus glaucus.

Segment 14

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 15

Potential threatened or endangered plant species habitat occurs along the segments between mileposts 14-15, 17.5-21.5, and 26-28. Potential species which are located along the segment are Astragalus detritalis, Lepidium barnebyanum cited as endangered, recommended as threatened, and Townsendia mensana cited and recommended as threatened.

Segment 16

Potential threatened or endangered plant species habitat occurs along the segment at milepost 9. Two potential species are known to inhabit this area, Cymopterus duchesnensis, and Eriogonum viridulun cited as threatened and recommended as delisted.

Segment 17

Potential threatened or endangered plant species habitat occurs along the segment from mileposts 0-3 and again at milepost 5.5. Potential species Eriogonum viridulum is located along the segment.

Segment 18

Potential threatened or endangered plant species habitat occurs between mileposts 1.5-2.5, 11-12, and 13-14 along the segment.

Segment 19

Potential threatened or endangered plant species habitat occurs along the segment between mileposts 0.5-2.5, 3-5 miles, 19.5-20.5, 30-30.5, and 37-39.5. Potential *Penstemon garrettii* cited as threatened, recommended as delisted occurs along the segment.

Segment 20

Potential threatened or endangered plant species habitat occurs from mileposts 0-2.2 along the segment.

Segment 21

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 22

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 23

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 24

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 25

Potential threatened or endangered species habitat of *Phacelia argilacea* occurs from mileposts 0-1.5 along this segment. Other threatened or endangered plant species habitat occurs between mileposts 4 and 5.

Segment 26

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 27

Potential threatened or endangered plant species habitat occurs between mileposts 3 and 4 along the segment. *Cymopterus duchesnensis*, and *Cryptantha breviflora* are found along the segment.

Segment 28

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 29

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 30

Potential threatened or endangered plant species habitat occurs from mileposts 12-12.8 along the segment.

Segment 31

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 32

Potential threatened or endangered plant species habitat is present on the segment between mileposts 2 and 3. Within this area, Astragalus duchesnensis, Astragalus detritalis, Cryptantha breviflora previously cited as endangered, now recommended as delisted, and Astragalus saurinus cited and recommended delisted.

Segment 33

Potential threatened or endangered plant species habitat is present on the segment at mileposts 3 and 5.

Segment 34

No potential threatened or endangered plant species habitat is known to occur along this segment.

Segment 35

Hedysarum boreale var. gremiale cited as threatened now recommended as sensitive non-official status occurs at about milepost 8 on the segment. Astragalus chloodes cited and recommended as threatened also occurs on the segment at about mile 17. From mileposts 19-24 and again at milepost 53 along the segment, Arabis demissa var. russeola, and Cryptantha stricta are known to occur. Other threatened or endangered species habitat occurs at milepost 73, milepost 76, milepost 102, and milepost 121 along this segment.

Segment 36

No potential threatened or endangered plant species is known to occur along this segment.

Segment 37

Penstemon garrettii, cited as threatened and recommended as delisted, occurs along the first 0.5 mile of this segment.

ANIMAL LIFE

Terrestrial

Animal life considered and depicted on the profiles in this section are: American bald eagle (endangered), the whooping crane (endangered), golden eagles, mule deer, antelope, elk, moose, turkey, sharp tailed grouse, sage grouse, and waterfowl.

Critical habitat for each species is depicted in the profiles and table 3-27. Critical habitat (based on rarity, uniqueness and/or protection by law) for each species is as follows:

Antelope--fawning areas
Deer, Elk, and Moose--fawning/calving and winter concentration areas
Sage Grouse--concentration areas and brooding/strutting grounds
Sharp Tailed Grouse and Turkey--concentration areas
Raptor--unique use area
Wild Horse--concentration area
Waterfowl and Whooping Crane--flyways
Bald Eagle--Use areas

Aquatic Animals

Important fishery streams along transmission line corridors are listed in table A. The fishery values presented in table 3-27 (critical, high priority, substantial, limited, and no fishery value) are according to Wydoski and Berry (1976). Criteria used to rank these streams were: (1) status of endangered species; and (2) importance of species of high interest. For endangered species, the fishery values of critical (documented occurrence, present or past, of species officially listed as endangered by the U.S. Fish and Wildlife Service) or high priority (probable occurrence of an officially listed endangered species) were assigned to streams. For species of high interest, fishery values are defined as: critical (necessary for high productivity, i.e., yield, natural reproduction, or outstanding fishery); high priority (an area of high use by the species); substantial (an existence area; loss of habitat would not impair productivity of the species within Utah); limited (the species may be absent or only found on occasion); and no value (live reaches of stream that contain no fish or no recreational or professional interest or

TABLE A

Important Fishery Streams
Crossed by Transmission Corridors

Stream	Fishery Value
Ashley Creek	High priority
Bear River[a]	
Beaver Creek[b]	Critical, substantial
Beaver Creek, West Fork	High priority
Black's Fork Creek[c]	
Birch Creek	High priority
Burnt Fork Creek	Substantial
Cold Springs Creek	Critical
Co-op Creek	Substantial
Cottonwood Creek[a,b]	High priority
Currant Creek	Substantial
Dalton Creek	Substantial
Deep Creek[b]	High priority, substantial
Duchesne River[c]	Substantial, limited
East Canyon Creek	Substantial
East Muddy Creek	Critical
Francis Creek	High priority
Gooseberry Creek	High priority
Gordon Creek	High priority
Green River	Critical
Henry's Fork River	Critical
Horse Creek	Critical
Huntington Upper	Substantial
La Chapelle Creek[a]	
Lake Creek	Substantial
Lake Fork	Substantial
Line Creek	Substantial
Little Dry Creek[a]	
Lost Creek	Critical
Mud Creek	Substantial
Nebo Creek	High priority
Ogden River	Critical
Ogden River, South Fork	Critical
Peterson Creek	Substantial
Price River[c]	Substantial
Provo River	High priority
Sage Creek[a]	
San Pitch River	Substantial
Smith Creek	Substantial
Smith Fork, East Fork[a]	
Smith Fork, West Fork[a]	
Soldier Creek	Substantial
Spanish Fork Creek	Substantial
Strawberry Creek	High priority

(continued)

APPENDIX 19, TABLE A (concluded)

Stream	Fishery Value
Strawberry River[c]	Critical, high priority, limited
Sulphur Creek[a]	
Thistle Creek	High priority, substantial
Trout Creek[b]	High priority, substantial
Weber River	Critical
West Muddy Creek	Critical
White River[b,c]	Critical, substantial
Willow Creek[a,b]	High priority

Source: Holden, 1979.
R. S. Wydoski and C. R. Berry, Jr., 1976.

[a]Fishery value given only as trout habitat.

[b]Values of different streams having the same name.

[c]Values for different locations of the same stream.

that may be dewatered at times). The streams that contain endangered and rare fish provide habitat for three endangered species (the Colorado squawfish, the humpback chub, the bonytail chub) and one formerly proposed threatened species (the razorback sucker).

CULTURAL RESOURCES

Nine sites were recorded during a low-level sample inventory of the transmission system. Two of these appear to be eligible for nomination to the National Register of Historic Places. Relative locations of these sites located during field inventories are shown in figures 3-8 to 3-23. A literature search of all transmission system corridor segments indicated the presence of an additional 387 sites in or near these corridors. Most of these were recorded before National Register eligibility was an issue; therefore, site significance is largely unknown. The field inventory and literature search phases are summarized in table B.

Inventories have been comparatively rare in the high Wasatch and Uinta Mountains. As a result, the bulk of the sites located through literature search are on the eastern end of the transmission system in the Uinta Basin and the western end of the system in the Great Basin. Again, the lack of recorded sites in the mid-portions of the system is due to a lack of inventory work in this area. However, if the entire system were intensively inventoried, it can be expected that the heaviest concentrations of sites would be on the two ends of the system.

VISUAL RESOURCES AND RECREATION

Visual Resources

Physical features crossed by the transmission lines include the Wasatch Plateau, Wasatch Range, Uinta Basin, and Uinta Mountains.

Visual resource management (VRM) information is shown in table 3-27 and depicted in figures 3-8 through 3-23. Visual resource information for private lands was developed using data from agency inventory and knowledge of the area by a team of visual resource specialists. (See Appendix 16 for definition of VRM terms.)

Detailed data on highways crossed by the transmission lines is summarized in tables C to I.

Recreation

Recreation sites within the transmission line corridors are listed in table 3-27. Existing visual constrast (rated low, medium, or high) is also shown.

LAND USE

Important land use areas within the transmission line corridors are farming and grazing areas, commercial timber areas, unroaded or off-road vehicle closure areas, existing coal mining operations, recreation areas, campgrounds, summer homes, a scenic road, and a pending Recreation and Public

APPENDIX 19 (continued)

TABLE B

Summary of Field Inventory and Literature Search Phases, Moon Lake Transmission Line Segments

Segment Number	Site Total Number	National Register Status: Listed	Eligible	Not Eligible	Need Data	Unknown Status
1	3	--	--	--	--	3
2	3	--	--	2	--	1
3 & 4	15	--	1	14	--	--
5	1	--	--	1	--	--
6	1	--	--	1	--	--
7	2	--	--	--	--	2
8	0	--	--	--	--	--
9	5	--	--	2	--	3
10	--	--	--	--	--	--
11	0	--	--	--	--	--
12	0	--	--	--	--	--
13	3	--	--	1	--	2
14	0	--	--	--	--	--
15	4	--	--	1	--	3
16	0	--	--	--	--	--
17	0	--	--	--	--	--
18	0	--	--	--	--	--
19	0	--	--	--	--	--
20	1	--	--	--	--	1
21-22	6	--	--	--	--	6
23	0	--	--	--	--	--
24	5	--	--	2	--	3
25	0	--	--	--	--	--
26	11	--	--	2	7	2
27	1	--	--	--	1	--
28	7	2	1	4	--	--
29	0	--	--	--	--	--
30	2	--	--	--	--	2
31	65	--	--	--	--	65
32	4	--	--	2	2	--
33	3	--	--	3	--	--
34	0	--	--	--	--	--
35	24	--	--	2	--	22
36	230	--	1	12	--	217
37	0	--	--	--	--	--
Total	396	2	3	49	10	332

TABLE C

Transmission Line Highway Crossings
Unit 1 Bonanza (Bonanza-Mona)

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Plant to Tank Hollow								
via Upalco/Fruitland	double circuit 138/345-kV	7	6	U-88	210	M	P	
		7	16	Cty-264	480	H	P	
		7	27	US-40	3,200	H	P	
	single circuit 345-kV	9	11	U-87	940	H	P	
		10	7	U-208	260	M	P	
		10	7-15	US-40	2,780	M	P	
			(6)[c]		(7,870)			
via Castle Peak/Sowers Canyon	single circuit 138-kV	16	5	US-40	2,800	H	P	
		19	30	U-33	255	L	P	
		19	40-65	US-6	4,075	H	P	
			3		(7,130)			
via Upalco/Sower Canyon	double circuit 138/345-kV	7	6	U-88	210	M	P	
		7	16	Cty 264	480	H	P	
		7	27	US-40	3,200	H	P	
	single circuit 345-kV	17	5	US-40	2,800	H	P	
		19	30	U-33	255	M	P	
		19	40-65	US-6	4,075	M	P	Spanish Fork Canyon existing 345-kV, 138-kV, 44-kV for 8 miles.
			(6)		(11,020)			
via Castle Peak/ Fruitland	single circuit 138-kV	17	5	US-40	2,800	H	P	
	single circuit 345-kV	10	7	U-208	260	M	P	
		10	7-15	US-40	2,780	M	P	
			(3)		(5,840)			
Tank Hollow to Mona								
via Dairy Fork	single circuit 345-kV	25	17	US-89	1,775	M	P	
		24	10	U-132	na	H	P	existing 44-kV, 138-kV, 345-kV.
		24	15	I-15	8,000	H	P	existing lines as above; town of Nephi.
			(3)		(9,775)			
via Thistle Canyon	single circuit 345-kV	20	0-10	US-6	5,000	H	P, FS	
		23	0-15	US-89	1,775	H	P	
		24	10	U-132	na	H	P	existing 44-kV, 138-kV, 345-kV.
		24	15	I-15	8,000	H	P	existing lines as above, town of Nephi.
			(4)		(14,775)			
via Utah Valley	single ciruit 345-kV	20	0-10	US-6	5,000	H	P, FS	
		21	0-10	US-6	5,600	H	P, FS	
		22	18	I-15	7,405	H	P	
		22	24	Cty-274	210	H	P	
			(4)		(18,215)			
Price Canyon Water Hollow								
via Eccles Canyon	single circuit 345-kV	37	1	US-6	3,910	L	P	Same existing as in Thistle Canyon and Dairy Fork.
			14	U-96	175	L	P	
			32	US-89	1,700	M	P	
			(3)		(5,785)			
via Spanish Fork Canyon/Dairy Fork	single circuit	19	40-65	US-6	4,075	M	P	Existing UP&L 345-138-kV.
via Sowers and Thistle Canyon	single circuit 345-kV	19	40-65	US-6	4,075	M	P	Existing UP&L 138-44-kV
		20	all	US-89				
		23	all					
		24	0-6					

[a]Average number of vehicles per day.

[b]H = High See Appendix 16 for definitions.
M = Medium
L = Low

[c]( ) Total number of highway crossings per alternative.

TABLE D

Transmission Line Highway Crossings
Unit 1 Bonanza 138-kV System

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Bonanza to Vernal (no alternative)	single circuit 138-kV	32	0-8	U-262	na[d]	H	BLM	
		33	0-6	U-262	na	H	S, P, BLM	existing 69-kV.
		34	0-4	U-262	na	H	P	existing 69-kV.
			(3)[c]					
Bonanza to Rangely Substation								
via Little Bonanza	single circuit 138-kV	1	5	U-45	285	M	BLM	
via Mellen Hill	single circuit 138-kV	3/4	5	U-45	285	M	BLM	
		3/4	17-24	Col-65	2,000	H	BLM, P	
			(2)		(2,285)			

[a]Average number of vehicles per day.

[b]H = High   See Appendix 16 for definitions.
M = Medium
L = Low

[c]( ) Total number of highway crossings per alternative.

[d]Not available.

APPENDIX 19 (continued)

TABLE E

Transmission Line Highway Crossings
Unit 2 Bonanza (Bonanza-Ben Lomond)

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Plant to Mountain Green								
via Lone Tree	single circuit 345-kV	32	0-8	U-262	na[d]	H	BLM	would parallel 138-kV from Bonanza 1.
		33	0-9	U-262	na	H	BLM, S, P	would parallel 138-kV from Bonanza 1; existing 69-kV.
		35	8	US-40	2,670	H	BLM	existing 68-kV.
		35	12	U-121	2,655	H	S	existing 138-kV.
		35	103	Wy-89	230	L	P	
		35	118	I-80	7,450	M	P	
		35	135	U-158	na	M	P	existing line.
			(7)[c]		(13,025)			
via Upalco/Fruitland	double circuit 345-kV							line could double circuit with Bonanza 1 to Upalco if that alternative had been chosen.
	single circuit 345-kV	30	6-18	US-40	2,500	H	P	existing 69-kV and 138-kV.
		30	42 alt.	US-89	1,665	M	P	
		30	53 alt.	US-89	1,415	M	P	
		30	56-67	US-189, I-80	6,200	M	P	
			(4)		(11,780)			
via Castle Peak/ Fruitland	single circuit 345-kV	10	10	U-208	260	M	P	
		10	7-15	US-40	2,760	M	P	
		30	6-18	US-40	2,500	H	P	
		30	42 alt.	US-89	1,665	M	P	
		30	53 alt.	US-89	1,415	M	P	
		30	56-67	US-189, I-80	6,200	M	P	
			(6)		(14,800)			
Mountain Green to Ben Lomond	single circuit 345-kV	31	0-24	I-80N	7,260	H	P	Ogden.
		31	12	I-15	4,000	H	P	Ogden; existing 138-kV (3), 230-kV, 345-kV. Urban area; figures are substantially larger.
			(2)		(11,260)			

[a]Average number of vehicles per day.

[b]H = High See Appendix 16 for definitions.
M = Medium
L = Low

[c]( ) Total number of highway crossings per alternative.

[d]Not available.

TABLE F

Transmission Line Highway Crossings
Unit 1 Rangely (Rangely-Mona)

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Plant to Tank Hollow								
via Upalco/Fruitland	double circuit 138-/345-kV	26	5-17	US-40	775	H	S, P, BLM	existing 138-kV.
		26	20	Col-64	970	M	P, BLM	
		26	28	U-45	275	L	BLM	
		7	6	U-88	210	H	P	
		7	16	Cty-264	480	H	P	
		7	27	US-40	3,200	H	P	
	single circuit 345-kV	9	11	U-87	940	H	P	
		10	7	U-208	260	M	P	
		10	7-15	US-40	2,780	M	P	
			(9)[c]		(9,890)			
via Castle Peak/Sowers Canyon	double circuit 138/345-kV	28	6-9	Col-64	880	M	P, BLM	
		28	13	Col-139	800	H	BLM	Rangely.
		29	1	U-45	285	M	BLM	existing 69-kV
	single circuit 138-kV	16	5	US-40	2,800	H	P	
	single circuit 345-kV	19	30	U-33	255	L	P	
		19	40-65	US-6	4,075	H	P	Spanish Fork Canyon; existing 345-kV, 138-kV, 44-kV for 8 miles.
			(6)		(9,095)			
via Upalco-Sowers Canyon	double circuit 138/345-kV	26	5-17	US-40	775	H	S, P, BLM	existing 138-kV.
		26	20	Col-64	970	M	P, BLM	
		26	28	U-45	275	L	BLM	
		7	6	U-88	210	M	P	
		7	16	Cty-264	480	H	P	
		7	27	US-40	3,200	H	P	
		17	5	US-40	2,800	H	P	
		19	30	U-33	255	L	P	
		19	40-65	US-6	4,075	H	P	
			(9)		(13,520)			
via Castle Peak/ Fruitland	double circuit 138-345-kV	28	6-9	Col-64	880	M	BLM, P	
		28	13	Col-139	800	H	BLM	Rangely
		29	1	U-45	285	M	BLM	existing 69-kV
	single circuit 138-kV	16	5	US-40	2,800	H	P	
			(4)		(4,765)			

[a]Average number of vehicles per day.

[b]H = High   See Appendix 16 for definitions.
M = Medium
L = Low

[c]( ) Total number of highway crossings per alternative.

TABLE G

Transmission Line Highway Crossings
Unit 1 Rangely 138-kV System

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Rangely Plant-Vernal Substation (no alternatives)	single circuit 138-kV	26						minimal impact--parallels Unit 1 138/345 lines.
		33	0-6	U-262	na[d]	H	BLM	existing 69-kV.
		34	0-4	U-262	na	H	P	existing 69-kV.
			(2)[c]					
Rangely Plant-SW Rangely Substation (no alternatives)	single circuit 138-kV	28	6-9	Col-64	880	M	BLM, P	Route would parallel 138-345-kV line if Castle Peak/Fruitland alternative was chosen above.
		28	13	Col-139	800	H	BLM	
			(2)		(1,680)			

[a]Average number of vehicles per day.

[b]H = High   See Appendix 16 for definitions.
M = Medium
L = Low

[c]( ) Total number of highway crossings per alternative.

[d]Not available.

TABLE H

Transmission Line Highway Crossings
Unit 2 Rangely (Rangely-Ben Lomond)

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Plant to Mountain Green								
via Lone Tree	single circuit 138-kV							Would parallel existing 138-kV; would also parallel 138/345-kV if Rangely 1 via either Upalco route was chosen.
	138-kV	33	0-6	U-262	na	H	P	existing 69-kV.
		35	8	US-40	2,670	H	BLM	
		35	12	U-121	2,655	H	S	existing 138-kV.
		35	103	WY-89	230	L	P	
		35	118	I-80	7,450	M	P	
		35	135	U-158	na	M	P	existing line.
			(6)[c]		(13,005)			
via Upalco/Fruitland	double circuit 138-kV	26,7, 9,10						Route could parallel 138/345-kV line to Fruitland if Rangely 1 with Upalco Fruitland route was chosen.
		30	6-18	US-40	2,500	H	P	existing 69-kV, 138-kV.
		30	42	Alt US-89	1,665	M	P	
		30	53	Alt US-89	1,415	M	P	
		30	56-67	US-189 I-80	6,200	M	P	
			(13)		(11,780)			
via Castle Peak/ Fruitland	single circuit 138-kV	28,29 10						Route could parallel 138/345 line to Fruitland if Rangely I with Castle Peak/ Fruitland route was chosen.
	single circuit 345-kV	30	(13)		(11,780)			Date same as shown for Upalco/Fruitland alternative.
Mountain Green to Ben Lomond	single circuit 345-kV	31	0-11	I-80N	7,260	H	P	Ogden.
			12	I-15	4,000	H	P	Ogden, existing 138-kV (3), 230-kV, 345-kV. Urban area, figures are substantially larger
			(2)		(11,260)			

Note: Data for tables C through I has been supplied by the Colorado, Wyoming, and Utah Highway Departments for 1978. In cases where multiple mileposts are listed, the transmission lines closely parallel the designated roads.

[a]Average number of vehicles per day.

[b]H = High See Appendix 16 for definitions.
M = Medium
L = Low

[c]( ) Total number of highway crossings per alternative.

TABLE I

Transmission Line Highway Crossings
Unit 2 Mona-Ben Lomond

Alternative	Tower Description	Segment	Milepost	Highway	ADT[a]	Existing Contrast[b]	Ownership	Remarks
Mona-Ben Lomond	Single Circuit	36	9	US-6/50	950	M	P	
			39	U-73	1,300	M	P	
			43-45	U-68	2,680	M	P	
			49	U-111	1,450	M	P	
			54	U-48	5,050	M	P	
			58	U-73	3,025	H	P	
			61	U-171	14,315	H	P	
			63	U-201/18	16,780	H	P	
			66	I-80	11,920	H	P	
			77-82	I-15	44,000	H	P	In close proximity to Farmington Bay Bird Refuge
			91	U-109	1,580	H	P	
			94	U-108	5,260	H	P	
			94-101	U-108	1,300	H	P	
			96	U-107	5,020	H	P	
			97	U-37	2,550	H	P	
			99	U-97	2,660	H	P	
			101	U-37	1,670	H	P	
			105	U-39	1,895	H	P	
			109	U-134	1,990	H	P	
Total Crossings/ADT			(19)[c]		(125,395)			

[a] Average number of vehicles per day.

[b] H = High   See Appendix 16 for definitions.
M = Medium
L = Low

[c] ( ) Total number of highway crossings per alternative.

Purpose Act sale area. Commercial timber areas are defined as producing 20 cubic feet of wood or more per acre pèr year. About 29 miles of commercial timber would be crossed by segment 35 (unit 2 proposed route) and 5.7 miles would be crossed by segment 37 (Eccles Canyon alternative). Two off-road vehicle closure areas exist within transmission line corridors on Forest Service land, one on the Ashley National Forest and one on the Uinta National Forest.

Prime and unique farmland and lands having water rights classified as of state-wide importance may exist on lands bordering major streams. Appendix 17 contains definitions of these land categories.

Communication facilities in proximity to transmission system segments are listed in table J.

Five Land and Water Conservation Fund properties are located along segment 30 and five are located along segment 36.

Sections of the Green and White Rivers that would be crossed by transmission routings have been identified through the Nationwide Rivers Inventory as possessing significant value as free flowing streams.

LAND USE PLANS AND CONTROLS

The BLM White River (1978), Bonanza (1974), Pioneer Trails and Salt Well Pilot Butte Management Framework Plans (1977) make land use recommendations based on wildlife, land use, recreation, cultural, and other resource considerations.

Land Management Plans are in the process of being formulated for the Manti-LaSal, Uintah, Ashley, and Wasatch National Forests. The Uinta National Forest, being further along in their planning process, has identified in their draft management plan a proposed major scenic road within segment 11, from the Strawberry Reservoir area to U.S. Highway 6/50, Soldier Summit area.

The Ashley National Forest has a Final Environmental Statement for the Vernal Planning Unit Land Use Plan. This Land Use Plan addresses management objectives for visual quality, commercial timber, water quality, and unroaded areas on the portion of the Ashley National Forest crossed by segment 35.

The Manti-Lasal National Forest is preparing a feasibility study for possible scenic road designation for the Skyline Drive road which would be crossed by segment 37 (Eccles Canyon alternative).

TABLE J

Air Navigational Facilities in Proximity to Transmission Routings

Facility	Segment
Bonanza Air Strip	3
Duchesne Municipal Airport	9
Morgan Municipal Airport	30
High Freguency Omnidirectional Range Station (VOR)	7
VOR	16
VOR	35

APPENDIX 20

Net Energy Analysis and Cost Comparison
of Moon Lake Project Alternatives

In net energy analysis, the energy and material inputs and outputs of a production process are quantified and analyzed to answer the question, "How much energy is required to produce the product?"

The Colorado School of Mines Research Institute (CSMRI) (1980) prepared a net energy analysis of the Moon Lake project. That study examined the resources necessary to build and operate both 400-MW units of the coal-to-electricity system. The materials needed to construct and operate the system (concrete, steel, trucks, pipe, wire, etc.) were expressed in terms of the number of British thermal units (Btus) of energy required to manufacture those materials from raw resources (e.g., ore in the ground). The energy sequestured in the materials used in construction and operation are indirect energy inputs to the system.

Direct energy inputs (gasoline, diesel, coal, electricity, etc.) were also expressed in terms of Btu equivalents, as were energy losses (coal not recovered during mining, coal lost during preparation, and internally consumed energy).

The annual inputs, outputs, and losses during the electrical production process were then compared for each alternative in terms of billions (10^9)of Btus (10^9 Btu is equivalent to 50 tons of coal or 7,200 gallons of diesel fuel). The direct and indirect energy requirements for construction of the system were apportioned over the 35-year life of the system in order to allow comparison on an annual basis.

The relative efficiencies of the alternative system components are as follows:

Coal Source: Coal source data were based on construction and operation of the Deserado Mine compared with coal obtained from the Danforth Hills No. 3 surface mine near Meeker, Colorado. Coal recovered from the Deserado Mine would require less investment of external energy and materials. However, unrecovered coal (coal lost as a result of the mining process) would be approximately 5 times greater for the Deserado Mine than the Danforth Hills No. 3 mine (see table A).

Coal Preparation. Energy and material requirements for coal preparation (1,282.9 X 10^9 Btu/yr) and preparation loss (5,650 X 10^9 Btu/yr) would be the same regardless of coal source.

Coal Transport. On the basis of external inputs, the electric railroad ranks first and the conveyor belt second in energy efficiency for either plant site (see table B). Energy inputs for coal transportation would be less if the plant were located on Rangely. The truck haul of open market coal would require the most energy inputs.

Generating Plant. Coal inputs, external energy and material inputs, energy output and generating loss would be the same for both the Bonanza and Rangely plant site (in 10^9 Btu/yr):

Inputs		Outputs	
External		Generation Loss	40,090
Energy	37.5	Electrical Output	16,720
Materials	549.8		
Total	587.3		
Coal input	56,810		

TABLE A

Coal Source Energy Comparison
(10^9 Btu/yr)

	Deserado Coal Mine			Open Market Coal[a]		
	Energy	Materials	Total	Energy	Materials	Total
Extraction Requirements[b]	408.9	76.0	484.9	1,090.0	271.4	1,361.4
Coal in Place			112,500.0			73,570.0
Coal Extracted			62,460.0			62,460.0
Unrecovered Coal[c]			50,080.0			11,110.0

[a]Based on coal from the Danforth Hills No. 3 surface mine near Meeker, Colorado.

[b]External energy and material inputs required to mine the coal.

[c]Unrecovered coal is coal made unavailable as a result of extracting part of the deposit. The amount unrecovered is a function of the character of the deposits (depth and width of seams), mining method, and economic constraints.

Water Pipeline. Energy requirements for construction and operation of the water pipeline to either plant site would be less if the White River were the water source (see table B).

Electric Transmission. Data on transmission line requirements were based on the applicant-proposed routes. Line construction and operation requirements would be greater if the plant were located at Rangely (see table B). Transmission losses from each plant site would be as follows:

Bonanza - 303.5 X 10^9 Btu/yr

Rangely - 393.0 X 10^9 Btu/yr

APPENDIX 20 (continued)

TABLE B

Direct and Indirect[a] Energy Requirements of Moon Lake Project Alternatives (10^9 Btu/year)

Alternative	Bonanza Plant Site			Rangely Plant Site		
	Energy	Materials	Total	Energy	Materials	Total
Coal Transport						
Deserado Coal						
Railroad	163.4	27.5	190.9	21.5	3.7	25.2
Conveyor	181.2	21.3	202.5	36.5	2.9	39.4
Slurry Pipeline	721.0	16.2	737.2	717.0	2.0	619.0
Off-Highway Truck	436.0	82.0	518.0	55.1	14.6	69.7
On-Highway Truck	475.5	43.4	518.9	68.0	10.4	78.4
Open-Market Coal[b]	1,188.0	45.6	1,233.6	890.0	31.9	922.8
Water Pipeline						
Green River Source	301.2	12.3	313.5	526.1	26.9	553.0
White River Source	187.7	7.4	195.1	140.5	5.8	146.3
Electrical Transmission						
Energy Requirements[c]	3.1	95.1	98.2	3.1	119.1	122.2

[a]Indirect energy is the energy sequestered in the concrete, wire, trucks, steel, etc., required to construct and operate the system.

[b]Open market coal data is based on on-highway truck haul of coal obtained from the Danforth Hills No. 3 surface mine near Meeker, Colorado.

[c]Requirements are based on applicant-proposed routes.

These losses are based on the length of applicant-proposed lines (457 miles from Bonanza; 578 miles from Rangely). Increasing or decreasing the transmission distances would cause corresponding increases or decreases in transmission loss at the following rates:

From Bonanza - 664.1 million Btu/mi/yr
From Rangely - 679.9 million Btu/mi/yr.

Conclusions. The applicant-proposed coal-to-electricity system is depicted in Appendix figure 1. It shows the energy and material inputs, losses, and system output for each operational stage. Table C compares the external energy and material requirements for the proposed Bonanza and Rangely plant site systems. While energy losses (unrecovered coal, coal preparation, and generation loss) and electrical output would be identical for each site, the Rangely system would require less external energy and material inputs (306.3 X 10^9 Btu per year). Comparison of the total external energy and material inputs for the applicant-proposed systems shows a 8.1-percent advantage for the Rangely site (2,663.0 X 10^9 Btu versus 2,957.7 x 10^9 Btu for Bonanza). However, when the coal energy inputs at the coal preparation stage (62,460 x 10^9 Btu) are added to the comparison, the advantage for Rangely drops to less than 0.47 percent.

It is noted that the Rangely plant site would save approximately 190 to 300 X 10^9 Btu/yr in external energy and material inputs; however, transmission losses from the Bonanza site would be less (303.5 X 10^9 versus 393.0 X 10^9 Btu/yr). Thus the net electrical energy deliverable from the substations would be 89.5 X 10^9 Btu/yr more if the Bonanza plant site were utilized.

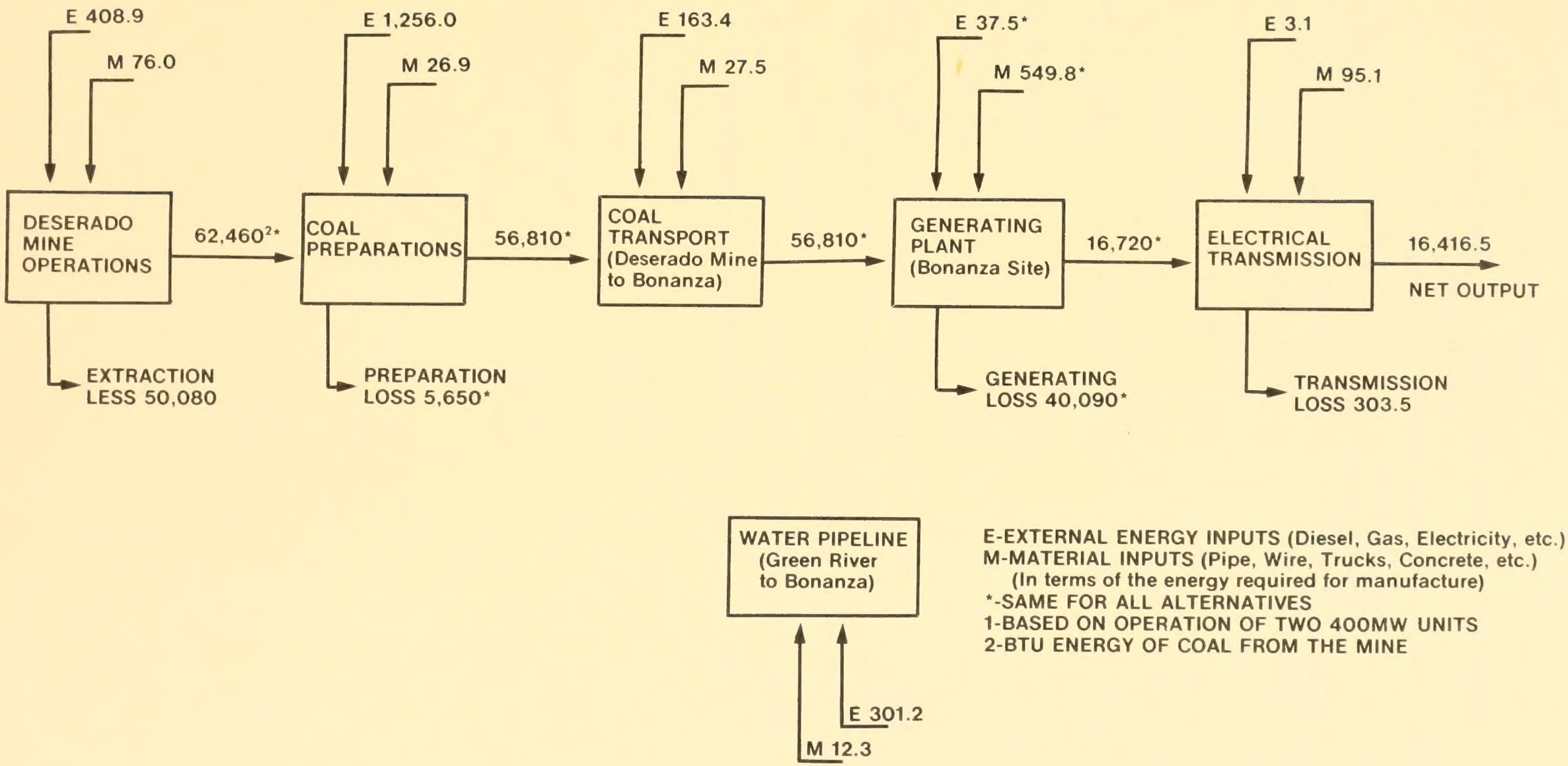
Clearly, factors other than energy analysis must be considered in the final decision on plant siting and system design/configuration. Such factors as costs, environment, energy mix, governmental regulations and incentives, available water, local attitudes and socioeconomic impacts, and needs for energy must be considered in the final decision.

Cost Comparison of Moon Lake Project Alternatives

Preliminary estimates of the capital and operating cost for Moon Lake project plant construction and raw material supply system alternatives are shown in table D.

Plant Construction

The plant construction costs shown in table D are for unit 1 labor and materials only and do not include engineering, legal, insurance, tax, overhead, and associated costs. Site preparation costs are included and constitute nearly $7 million of the cost difference between Bonanza and Rangely. Excavation at Rangely would be more difficult (due to a greater percentage of rock excavation) and require movement of approximately 25-percent more material. The cost differential would be greater if the costs of substructures at Rangely were included. However, estimates of these costs were available for only the Bonanza site (Burns and McDonnell, 1980e).



APPENDIX FIGURE 1-

APPLICANT PROPOSED
COAL-TO-ELECTRICITY SYSTEMS
INPUTS, OUTPUTS AND LOSSES (10^9 BTU/YEAR)

Appendix 20 (continued)

TABLE C

Comparison of Inputs and Losses for Plant Site Alternatives
(10^9 Btu/yr)

System Element	Bonanza Plant Site: External Inputs: Energy	Materials	Total	Losses	Rangely Plant Site: External Inputs: Energy	Materials	Total	Losses
Deserado Coal Mine Operations	408.9	76.0	484.9	50,080.0	408.9	76.0	484.9	50,080.0
Coal Preparation	1,256.0	26.9	1,282.9	5,650.0	1,256.0	26.9	1,282.9	5,650.0
Coal Transport[a]	163.4	27.5	190.9	--	36.5	2.9	39.4	--
Generating Plant Operation[b]	37.5	549.8	587.3	40,090.0	37.5	549.8	587.3	40,090.0
Water Pipeline Operation[c]	301.2	12.3	313.5	--	140.5	5.8	146.3	--
Electrical Transmission	3.1	95.1	98.2	303.5	3.1	119.1	122.2	393.0
Totals	2,170.1	787.6	2,957.7	96,123.5	1,882.5	780.5	2,663.0	96,213.0

[a]Railroad for Bonanza, overland conveyor for Rangely.

[b]Electrical output would be 16,720 X 10^9 Btu/yr from either site.

[c]Green River water source for Bonanza; White River water source for Rangely.

TABLE D

Preliminary Cost Estimates
Plant Site and Raw Material
Supply System Alternatives[a]
($1,000)

Alternative	Bonanza Site	Rangely Site
Plant Construction	396,725[b,c]	403,700[b,c]
Coal Transportation		
Railroad		
Capital	32,962	10,411[b]
Operating	1,432	477[b]
Conveyor		
Capital	31,523	4,602[b]
Operating	1,566	175[b]
Slurry Pipeline		
Capital	38,341	24,623[b]
Operating	3,114	308[b]
On-Highway Truck[d]		
Capital	3,916	1,305
Operating	7,113	1,704
Off-Highway Truck[d]		
Capital	9,874	2,633
Operating	14,157	2,068
Open-Market Source		
Capital	11,747	5,839
Operating	19,557	11,941
Water Source[b,e]		
Green River		
Capital	26,775	42,195
Operating	658	1,135
Taylor Draw Reservoir		
Capital	N/A	4,696
Operating	N/A	166

(continued)

APPENDIX 20, TABLE D (continued)

Alternative	Bonanza Site	Rangely Site
Wolf Creek Reservoir		
Capital	N/A	4,696
Operating	N/A	166

Source: Burns and McDonnell, 1980e; Ford, Bacon and Davis, 1979.

[a]Capital and 1-year operating costs. Two 400-MW units in operation except as noted.

[b]Unit 1 costs only.

[c]Plant construction costs include labor and materials. Costs associated with engineering, land and land leases, legal fees, subsurface investigations, working capital requirements, owner overhead, insurance, sales tax, property tax, socioeconomic mitigation, initial inventories, overhead contingency, or interest during construction are not included.

[d]Costs do not include road construction or upgrading of existing highways.

[e]Water rights and reservoir construction and operation costs excluded.

Coal Transport

Bonanza Plant Site

Comparison of coal transport alternative capital costs shows the on-highway truck haul alternative would have the least initial (capital) cost. However, when the annual operating costs are included comparison shows that the railroad and conveyor would be the most economic methods of coal transport from the Deserado Mine. The higher capital cost of the railroad offsets its operating cost advantage over the conveyor.

Rangely Plant Site

Coal transport capital and operating costs would be substantially less if the plant were located at the Rangely site. The conveyor would constitute the most economic method for the Deserado Mine to Rangely site coal transport.

Water Source

Costs shown do not include the cost of purchasing water rights or water. Capital and operating costs of the water system would be less at the Bonanza plant site if the White River were the water source. The Wolf Creek Reservoir would be the least costly source of water for the Rangely site. This cost would be paid by the Colorado River Water Users Association No. 1 rather than by Deseret.

Transmission System

Construction costs of transmission system alternatives are shown in table E. Construction costs favor the Bonanza plant site. The applicant-proposed routes are the least costly for either plant site.

These construction cost estimates were provided by Burns and McDonnell (1980e). They were compared with estimates based on Western Area Power Administration (WAPA) data for construction of 138- and 345-kV transmission lines and found to be 10- to 30-percent less in most cases.

TABLE E

Transmission System Construction Costs
($1,000)

	Bonanza Site	Rangely Site
UNIT 1		
345-kV to Tank Hollow 138-kV to Upalco		
via Upalco-Fruitland[a]	$27,824	$36,241
via Castle Peak-Sowers Canyon	30,896	41,038
via Upalco-Sowers Canyon	31,398	39,804
via Castle Peak-Fruitland	28,845	38,987
Tank Hollow-Mona Substation (345-kV)		
via Dairy Fork[a]	10,797	10,797
via Thistle Canyon	10,946	10,946
via Utah Valley	16,204	16,204
Price Canyon to Water Hollow (345-kV)		
via Eccles Canyon	9,819,700	9,819,700
via Sowers Canyon/Dairy Fork	13,548,700	13,548,700
via Sowers Canyon/ Thistle Canyon	13,673,000	13,673,000
138-kV to Vernal Substation[a]	2,629	5,599
138-kV to Rangely Substation[a]	--	1,598
via Little Bonanza[a]	2,443	--
via Mellen Hill	2,649	--
UNIT 2		
345-kV to Mountain Green		
via Lone Tree[a]	33,950	36,141
via Upalco-Fruitland	33,612	36,777
via Castle Peak-Fruitland	33,482	37,297
Mountain Green to Ben Lomond[a]	9,425	9,425
Mona to Ben Lomond	59,583	59,583

Source: Burns and McDonnell, 1980e.

[a]Applicant-proposed route.

APPENDIX 21

Acid Rain

The formation of acid in the atmosphere is not well understood at this time although it does occur. Research about this phenomena is going on at this time.

Environmental effects of acid rain have been most intensively researched in the eastern United States and Scandinavia. Some of the reported effects are acidification of lakes, rivers, and ground waters resulting in damage to fish and other components of aquatic ecosystems; possible reduction in forest productivity; possible damage to agricultural crops; and acidification and release of metals from soils. Environmental effects of acid rain in the western United States, with more alkaline soils, lower relative humidity and less atmospheric loading of pollutants have not been shown to be as serious as those in the eastern United States and Scandanavia. In high elevation areas, acid substances accumulating in the snowpack may be released in concentrated form during snowmelt and cause sudden increases in the acidity of surface soils, vegetation, and surface water. Lower plant forms such as lichen in alpine areas are efficient accumulators and are thus especially sensitive to acids.

With burning of low sulfur Western coal (as is the case with the proposed Moon Lake power plant) coal-fired power plants would contribute less to acid precipitation than plants using higher sulfur.

APPENDIX 22

Visibility Modeling

Four parameters related to visual impairment were calculated. These are percent visual range reduction, the blue-red ratio, plume contrast, and delta E.

Visual range is defined as the farthest distance at which a black object can be perceived against the horizon sky. Plume contrast is a comparison of light intensities of the plume and the horizon. If the contrast is a positive number, then the plume is brighter than the horizon. Negative plume contrasts indicate a plume is darker than the horizon. It is commonly assumed that the liminal contrast (the least contrast which is perceptible) is ±0.02 (EPA, 1979b). However, the liminal contrast of a plume may be greater due to the somewhat diffuse boundary between a plume and its background. The blue-red ratio is the ratio of intensity of blue light (0.4 µm wave length) to red light (0.7 µm wave length). It is estimated that if the blue-red ratio is 0.90 or less, the plume will have a perceptible yellow-brown color (Latimer and Samuelsen, 1978). Delta E is proportional to the perceptibility of color differences due to changes in brightness and changes in chromaticity. Thus, the delta E for a plume against a viewing background can be used as an indicator of plume perceptibility and atmospheric discoloration: plumes with delta Es between 5 and 10 would be detected as a slight discoloration by most people, and the severity of discoloration increases with increasing delta E (Systems Application, Inc. [SAI], 1980).

Results of Visibility Modeling

Bonanza Plant Site

To estimate impacts at the scenic overlook and the visitor center from a plant located at the Bonanza site, a base case and variations on the base case were defined and the model was run for views from each vantage point. The base case assumed slightly stable (isothermal) conditions, the median background visual range of 196 km, and the average background ozone concentration of 30 parts per billion (ppb).

Impacts Viewed From the Visitor Center

The analysis for the base case indicated that a dark yellow-brown plume would be perceptible for all viewing angles considered. Values of delta E ranged from 9.9 (a slight discoloration) to 24.6 (a strong discoloration). Delta Es greater than 20, indicating strong discoloration, occurred for five of the 16 viewing angles. Blue-red ratios for all viewing angles indicated perceptible discoloration and the plume contrast for all angles would be perceptibly darker than the background sky. Percentage visual range reduction would be less than 5 percent for most viewing angles, although a reduction of 30 percent was calculated for the viewing angle looking most nearly along the plume axis toward the plant.

The effect of raising the background ozone concentration to 70 ppb (the highest value recorded during 1978) was considered next. Although percentage visual range reduction remained the same, atmospheric discoloration increased. This was due to increased oxidation of NO to NO_2 in the presence of higher ozone concentrations. Values of delta E ranged from 10.4 to 30.2, with 9 of

16 viewing angles having delta Es greater than 20, which indicates a strong discoloration.

Shifting the wind direction by 11 degrees would transport the plume farther from the visitor center and would lessen impacts considerably resulting in only a slightly perceptible discoloration.

Impacts Viewed From the Scenic Overlook

The analysis of the base case indicated a maximum delta E of 8.4 corresponding to a plume contrast of -0.06 and a blue-red ratio of 0.87. This would result in a faintly visible dark yellow plume. Maximum reduction in visual range would be 4.3 percent with less than a 2-percent reduction for most viewing angles. When using a higher ozone concentration of 70 ppb, delta E reaches a maximum of 10.9 compared to 8.4 for the base case. With both a higher background ozone concentration and a higher background visual range, the maximum delta E is increased to 13.4. These cases would occur with less frequency than the base case (SAI, 1980).

The analysis for neutral stability conditions indicated that the plume would not be visible.

Rangely Site

For the analysis of potential visibility impacts at Dinosaur National Monument (Dinosaur) resulting from a plant at the Rangely site, Burns and McDonnell used the plume visibility model that SAI developed for EPA, whereas SAI calculated impacts for the Bonanza site.

Impacts Viewed From the Visitor Center

The case studied assumed slightly stable conditions (E stability-isothermal), a wind speed of 2.5 m/s, a background ozone concentration of 70 ppb, and a wind direction that would transport the plume as near to the visitor center as terrain would allow.

The analysis predicted that a dark yellow-brown plume would be perceptible for all viewing angles considered. Values of delta E ranged from 12.8 to 30.2 with delta Es greater than 20 for 4 of 11 viewing angles. Blue-red ratios for all viewing angles indicated a perceptible discoloration and the plume contrast for all viewing angles would be perceptibly darker than the background sky. Percentage visual range reduction would be less than 5 percent for most viewing angles, although a reduction of 17 percent was calculated for the viewing angle looking most nearly along the plume axis downwind away from the plant (Burns and McDonnell, 1980a).

Impacts Viewing From the Scenic Drive Overlook

The analysis assumed the same conditions as considered for the impact analysis for the visitor center. The analysis predicted that a yellow-brown plume darker than the background sky would be perceptible for all viewing angles considered. Values of delta E ranged from 11.8 to 24.3, with delta Es greater than 20 for 2 of 11 viewing angles. Blue-red ratios and plume contrast for all angles indicated perceptible dark discoloration. Reduction of visual range was less than 5 percent for 8 of 11 viewing angles and was a

maximum of 10.6 percent for the line of sight most nearly parallel to the plume axis looking toward the plant (Burns and McDonnell, 1980a).

Summary of Visibility Impacts

In summary, although impacts to visual range would be small, a yellow-brown plume would be visible from both the scenic overlook and the visitor center on days with stable, light wind conditions, and with winds that would transport emissions past the respective observer locations. Impacts would be greater at the visitor center than at the scenic drive overlook. The predicted impacts at the visitor center are about equal for Rangely and Bonanza plants, while impacts at the scenic drive overlook would be somewhat greater with a Rangely plant than with a Bonanza plant. However, because predominant wind directions at plume height are west-northwest counter-clockwise through south-southeast, with few easterly winds, impacts at the visitor center and scenic drive overlooks would occur more frequently with a plant at Bonanza than with a plant at Rangely. The EPA, recognizing that Dinosaur is presently a Federal Class II area, considers the visibility requirements of the PSD regulation to have been met (EPA, 1980).

APPENDIX 23

United States Department of the Interior

FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO–UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

IN REPLY REFER TO:

December 5, 1980

Moon Lake Power Project
6-5-80-F-507

MEMORANDUM

TO: State Director
Utah State Office
Bureau of Land Management
Salt Lake City, Utah

FROM: Area Manager
Area 5
Fish and Wildlife Service
Salt Lake City, Utah

SUBJECT: Section 7 Consultation on Deseret Generation and Transmission Cooperative, Moon Lake Project

This biological opinion was prepared pursuant to Section 7 of the Endangered Species Act (ESA) and in reply to your memorandum of June 18, 1980. This opinion addresses expected effects of the Moon Lake Project (MLP) on the listed threatened and endangered species given to you in a species list prepared January 4, 1980. We have also addressed the bonytail chub (*Gila elegans*) which was listed as endangered on April 23, 1980. The bonytail chub was included in our species list as a proposed species.

BIOLOGICAL OPINION

It is our biological opinion that the MLP is not likely to jeopardize continued existence of the endangered bald eagle, black-footed ferret, and the Uinta Basin hookless cactus. However, it is also our opinion the MLP as proposed is likely to jeopardize continued existence of the Colorado squawfish (*Ptychocheilus lucius*), the humpback chub (*Gila cypha*), and the bonytail chub.

PROJECT DESCRIPTION

Deseret Generation and Transmission Cooperative (Deseret) propose to build and operate two 400-megawatt coal-fueled generating units. The Bureau of Land Management (BLM) is evaluating the proposed MLP because Deseret has applied

for right-of-way permits to use public land. BLM has stated the purpose and described the proposed MLP in a preliminary draft environmental impact statement (PEIS). The purpose of the MLP is to meet future needs of Deseret in supplying base load energy for population growth, and economic development within Utah and Colorado.

As proposed initial construction of one 400-megawatt unit would begin in 1981 and brought on line by 1985. Depending on future power needs, a second generating unit would be built as early as 18 months following the start of the first unit or as late as 1990. The second unit start would depend on energy needs of Deseret and other participating companies. Other facilities of the applicant's proposal include an underground coal mine approximately 7 miles northeast of Rangley, Colorado, railroad facilities from the mine to the plant site, a water pipeline from an approved water source to the site, and an electric transmission system.

For the purposes of this biological opinion the applicant's proposal is the only action being addressed. The PEIS prepared by BLM discusses two alternative plant sites and various water source and transmission line system alternatives but they will not be addressed in this biological opinion. Deseret's preferred location for the power plant is near Bonanza, Utah, with water being pumped directly from the Green River about 2.5 miles upstream from Walker Hollow and piped to the plant. Water for the plant would be supplied from a 30 cubic-feet-per-second (21,720 acre-feet) water right owned by Deseret. The water supply system would consist of a collection well system and a 19-mile pipeline to the plant site. The collection well system involves the placement of wells into permeable materials adjacent to the Green River and water being pumped from the wells rather than directly from the river.

An onsite water storage reservoir with a capacity of 400 acre-feet would be necessary to hold water being pumped from the river before its use at the plants. At maximum production the two units would consume appromately 17,470 acre-feet of water annually.

The applicant's proposed electrical transmission system would use existing corridors as much as possible. Electricity generated by Unit 1 would be distributed to four transmission lines, one 345 kilovolt (kv) alternating current (a.c.) line, and three 138-kv a.c. lines. If Unit 2 were constructed a second 345-kv would be built however actual destinations of the line would depend on power demands at the time.

BASIS OF OPINION - JEOPARDIZED SPECIES

The primary area of concern in this biological opinion is the Green River from the confluence with the Yampa River downstream to the confluence with the Duchesne and White Rivers. This includes roughly 90 miles of the upper main-stem Green River. Figure 1 shows the location of the area of concern in relation to the proposed MLP. The Green River and its tributaries comprises much of the remaining habitat for the three native fishes of concern. The flows of the Green River are essential to the Colorado River in providing water to meet existing water demands and providing habitat for the Colorado squawfish, humpback chub and bonytail chub.

The Colorado squawfish, humpback chub and bonytail chub were once found throughout the Colorado River system from the Gulf of California to southwestern Wyoming. Presently, the squawfish is limited to the upper mainstem and major tributaries of the Colorado River System. The humpback chub and bonytail chub are found only in limited areas within the Colorado River System in Colorado, Utah, and Arizona. The bonytail chub also occurs in Lake Mohave in Arizona and the river below. The primary cause of decline for the three listed species is human alteration and degradation of the river environment. Major impoundments and water diversions have depleted water and altered temperature, turbidity, and stream flows, thus reducing available aquatic habitat.

Another important cause of decline is the increased number of exotic fishes, however this increase in exotics is also a function of habitat changes. Although correlations exist between declining native fish populations and increasing populations of exotic fish, cause and effect are not fully understood. However, we believe that fewer exotic fishes would be present if the river more closely resembled its natural state.

Information regarding the specific life history requirements and distribution of the Colorado squawfish, humpback chub, and bonytail chub is limited. Knowledge of these fishes has been limited partly because they have been of little interest to the public until recent years (true of many imperilled species). Also, these fishes are difficult to capture or observe because the waters they inhabit are usually swift and turbid, and access is limited in many of the canyon reaches.

As proposed the MLP is expected to deplete the Green River by 17,470 acre-feet per year and has the potential of depleting up to 21,720 acre-feet per year if the entire 30 cfs water right is used. Maximum water withdrawal from the Green River for the project would reduce the average annual low flow by about 2.0 percent. Although the depletions are not large compared to average water flows their effects on water quality and required fisheries habitat may be significant. The Green River comprises much of the remaining unaltered habitat for the endemic fishes and is considered essential for the survival of the squawfish, humpback chub and bonytail chub. Records of observations and collections over the past years show the fishes have been declining. Researchers studying the endangered fishes agree that because specific habitat requirements are not known further changes in the aquatic environment resulting from impacts such as water depletions should not occur until we know the specific needs of the three listed fishes.

Flow depletion in the Green River at critical times have immediate and long-term effects. The immediate effect is the reduction of required habitat. The depletion of water during peak runoff periods may lower the overall reproductive success of the fishes. Flows below an unknown critical level could result in the loss of habitat restricting the endangered fish population increasing the danger of disease and predation by other fish. Long-term effects of flow reduction will change the hydraulics of the river which alter stream bank cutting, meander patterns, backwater building, sediment transport capacitities, and velocites. With time, eddies, pools, riffles, river banks and beds along with depth, width, and flow patterns can be greatly changed. These changes as well as subtle changes in temperature and turbidity may affect the fishes

reproduction and other life stages. However it is our opinion the reduction in flow would be more limiting to the endangered fishes than the changes in water temperature or salinity. The endangered fishes are warm water creatures adapted to a wide range in temperatures and salinities. Although in the past the lack of reproduction in certain areas of the Green River has been attributed to low water temperatures, the changes as a result from the MLP would not be significant enough to change the water temperature of the Green River. Estimated changes in salinity of the Green River are expected to be an increased 0.8mg/l at Green River, Utah. It is our opinion this slight change would not affect the fishes as much as the actual withdrawal of water because the fishes have been observed and collected in waters with much greater salinity levels.

As stated before we do not know all the specific life history requirements and exact distributions of the three endangered fish. However, we are rapidly gathering information on the listed endangered fishes as well as the razorback sucker which is still considered in a precarious state but is no longer under Federal protection.

A Colorado River Fishes Investigation Team was established in April 1979. This team is staffed with Fish and Wildlife Service (FWS) personnel and has funding from the Water and Power Resources Service (WPRS) and the BLM. Other participants are the Utah Division of Wildlife Resources (DWR) and Colorado Division of Wildlife (DOW).

The objectives of this investigation are to learn specific life history requirements of the endemic fishes and gather data on the distribution and abundance. Most of the field work is being carried out in the Green and Colorado Rivers where the fishes are known to reproduce and where impacts from major impoundments and water diversions are the greatest. Information obtained during the study via field, laboratory, and hatchery work will make it possible to provide specific flow and water quality recommendations to maintain and develop more favorable habitat for the listed fishes in the Green and Colorado Rivers.

In addition to this study on the endangered fishes, other studies have been and will be conducted on the Green, Colorado, and the major tributaries to aid in making specific flow recommendations. Bio/West Incorporated, Logan, Utah, under contract to FWS, has completed a study of the effects of modifying the intake works of Flaming Gorge Dam. Bio/West also recently completed a study for National Park Service on the relationship of flows in the Yampa River on rare fishes in the Green River. From 1975-1978, Colorado State University conducted a survey of the White and Yampa Rivers for BLM. This study was to obtain baseline data to complement work by DOW and other resource agencies prior to strip mining of coal in northwestern Colorado. Also DOW has intensively monitored and will continue to monitor the fishes in the Colorado, Yampa, White, and Gunnison Rivers.

The information gained from the various studies discussed above will render valuable information for managing the endangered fishes in the Green River, and on the basis of this new information, consultation could be reinitiated, in hopes of a favorable biological opinion. However, the studies may show that present flows are already inadequate and unless the flows are somehow improved, endangered fish populations will continue to decline.

ALTERNATIVES

Section 7 of the Endangered Species Act requires FWS to recommend reasonable and prudent alternatives for any proposed project likely to jeopardize the continued existence of a listed species. The purpose of the alternatives are to avoid jeopardy to a listed species while allowing implementation of the proposed project or an alternative that would accomplish the desired objective.

Section 7 requires the consulting agency (in this case BLM) to ensure that its actions will not jeopardize a listed species. The depletion of an additional 17,420 acre-feet of water from the Green River has the potential to jeopardize the continued existence of the Colorado squawfish, humpback chub, and bonytail chub. It is our opinion that implementation of one or a combination of one or more of the following alternatives would allow construction of the MLP and avoid jeopardizing the continued existence of the three endangered fishes.

The preliminary draft environmental impact statement (PDES) discusses various water sources and cooling alternatives. We did not address the water sources other than the applicant's preferred alternative because each of the other water sources would necessitate the construction of a dam on the White River (a major tributary of the Green River system) or on a tributary of the White River. An opinion concerning the effects of constructing such a dam would prejudge the project prior to initiation of consultation by the Federal agency involved with the project.

Therefore this biological opinion addresses the applicant's proposed action and its impact on the endangered fishes in the Green River. If you want us to address each of the other water source alternatives separate consultation should be initiated with our office.

The PDES discussed the possibility of purchasing water held in Flaming Gorge Reservoir from WPRS. If the water purchased from Flaming Gorge remains in the Green River, replacing the water withdrawn from the collective well system and if this make-up water is released on a daily basis from Flaming Gorge equal to the amount being diverted for the MLP the endangered fishes would not be affected. Therefore, jeopardy to the fishes would be precluded. This alternative would allow the applicant to construct the proposed project as planned and then if our studies conclude a certain amount of water can be removed without jeopardizing the listed fishes, Deseret could either resell their 30 cfs water right or use the water in future development plans. We view this as the best alternative since it would allow Deseret to construct the MLP and not wait for the results of our investigative studies.

BLM stated in the PDES the use of groundwater as an alternative water source would not be economically feasible because of the low quantities and high salinity levels of the water. We recognize the use of such water would not be as desirable as using surface water sources. However, we believe the use of saline water for cooling power plants may be worthy of consideration because supplies of surface waters are rapidly dwindling and their use have the potential of jeopardizing federally listed endangered species. In the future we can see the remaining waters of the Colorado River Basin becoming even more costly and having even greater environmental value. Recent advances in technologies are making the use of saline water more economically feasible if all costs of using surface waters are evaluated.

As discussed in the PDES we agree the use of dry- or wet-dry cooling towers as an alternative to using water from the Green River for conventional wet cooling towers may be more costly. However considering the use of dry cooling or a combination wet-dry cooling towers could reduce the total water consumed by the plant by up to 4000 or 5000 acre-feet per year and their use may preclude jeopardizing the Colorado squawfish, humpback chub, and bonytail chub thus eliminating a sensitive environmental issue that may delay construction of the MLP, we recommend Deseret give more consideration to these alternatives, to pumping water from the Green River.

Upon receipt of this biological opinion and as prescribed in the 1979 amendments to the Endangered Species Act the consulting federal agency (BLM) must respond to us once selection of an alternative that would preclude jeopardizing the endangered species has been determined. We would then make the final decision as to whether the alternative selected would avoid jeopardizing the species.

BASIS OF OPINION - NONJEOPARDIZED SPECIES

BALD EAGLE

The bald eagle occurs in the project area mainly as a winter resident and a spring and fall migrant. Bald eagles congregate at specific wintering sites in Utah from late October through March. Open water on the Green River and its major tributaries during spring and fall attract eagles because of the fish and waterfowl availability. Deer carcasses along the riparian zone also provide additional food for the wintering eagles. The riparian habitat provide roost sites and other small mammals for food sources.

Although the bald eagle may range into the project area we do not believe there would be significant impact to the species from the proposed project nor would it jeopardize its continued existence.

BLACK-FOOTED FERRET

Based on the best available information, the black-footed ferret has never been reported in the project area. However, suitable habitat for the ferret may exist at prairie dog towns scattered throughout the project area. Recognizing the historical dependence of ferrets on prairie dogs, and the secretive nature of ferrets, and in an attempt to promote the conservation of this species BLM should require Deseret to conduct ferret surveys as part of their permit. If the surveys indicate presence of ferrets, consultation should be reinitiated.

UINTA BASIN HOOKLESS CACTUS

It is our opinion the listed Uinta Basin hookless cactus will not be affected by the construction of the MLP as proposed. With the recent changes in the coal transporting system and the survey performed during the preparation of the environmental assessment portion of the PDES we have to concur the project is not likely to jeopardize the listed cactus.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO—UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

December 18, 1980

IN REPLY REFER TO:

MEMORANDUM

TO: State Director
Utah State Office
Bureau of Land Management
Salt Lake City, Utah

FROM: Acting Area Manager
Area 5
Fish and Wildlife Service
Salt Lake City, Utah

SUBJECT: Amendment to Biological Opinion on Deseret Generation and Transmission Cooperative, Moon Lake Project

This memorandum is an amendment to the Fish and Wildlife Service biological opinion of December 5, 1980 on Deseret Generation and Transmission Cooperative, Moon Lake Project (MLP).

In discussing the overall effects of the MLP on the endangered fishes of the Colorado River Basin we failed to address the Deserado mine and the water that would be withdrawn from the White River for the mining activity. Regardless of the plant site or water source alternative selected by the Bureau of Land Management (BLM) for the MLP, mining activity and the withdrawal of water from the White River would be the same in terms of both volume and location.

As stated in the Preliminary Draft Environmental Impact Statement (PDEIS) water for the Deserado Mine would be collected from four small-diameter percolating wells adjacent to the river. Estimated water depletion for both MLP units, from the White River for the mine would be up to 304.8 acre-feet per year. Although this water depletion is small and may not be significant under normal water conditions, it is our opinion in considering the cumulative water depletion of the entire MLP preferred alternative, the depletions may jeopardize continued existence of the Colorado squawfish, humpback chub, and bonytail chub.

We have addressed the basis of our opinion for the water withdrawal and the alternatives that would avoid jeopardizing the endangered fish of the Green River in our December 5 biological opinion.

It is our opinion, because of the small volume of water that would be taken from the White River for the mining activity, the effects would only be significant under low-flow or drought conditions. However, we believe the withdrawal must be viewed as an integral part of the overall MLP.

To assure that withdrawal of water from the White River does not jeopardize the listed fishes under low-flow conditions, selection and implementation of one of the following alternatives should be made.

The PDEIS discussed the alternative of purchasing farmlands holding water rights on the White River in the amount needed to replace the water used for the coal mining activities. If this irrigation water is allowed to remain in the river the effects of pumping water for the mine would be negligible and would preclude jeopardy to the species.

A second alternative would be the pumping and piping of groundwater to the Deserado Mine. Since the volume of water needed for operating the mine is relatively small, the development of groundwater wells might prove worthy of your consideration. The use of groundwater would avoid jeopardizing the species since water from the White River would no longer be needed. Either of these alternatives would be acceptable to us as means to avoid jeopardizing the species.

As mentioned in our December 5 opinion, the Endangered Species Act 1979 Amendments requires BLM to respond in writing once selection of an alternative has been made that would avoid jeopardizing the species.

William C. White

GLOSSARY

A-Weighted Sound Level (dBA). The measurement of sound approximating the auditory sensitivity of the human ear.

Acre-foot. The volume of water (43,560 cubic feet) required to cover 1 acre to a depth of 1 foot.

Air Quality. The condition of the air usually expressed by the content of various chemicals and particles naturally or artificially occurring in the area.

Alkaline. Having a pH greater than 7.

Alluvial. Deposited by running water, pertaining to or consisting of silt, sand, and gravel.

Alluvial Well. Well which is placed in alluvium.

Anaerobic. A biological process occurring in the absence of free oxygen.

Animal Unit Month (AUM). Th amount of forage necessary for the sustenance of one cow or its equivalent for one month (usually 800 lbs. of air dry forage).

Aquifer. Water-bearing permeable rock, sand, or gravel.

Average Daily Traffic (ADT). The total number of vehicles traveling both directions on a section of road during a time period divided by the number of days in that time period.

Bag Filter. A filtering apparatus made of a cloth bag through which gases are passed to capture solid particles suspended in the gas.

Bag House. The large chamber or room for holding bag filters used to filter gas streams from a furnace.

Best Available Control Technology (BACT). Various methods and equipment available within the current technology to best control air pollutants and dust generated during construction, mining, or industrial (including power plant) activities.

Biota. Animal and plant life characterizing a given region; flora and fauna.

Borrow Area. An area used as a source of borrow material.

Borrow Material. Material (dirt, sand, gravel, etc.) excavated from a borrow area and used as fill elsewhere.

Catch Pan. A devise which fits under a coal conveyor belt to catch spillage and prevent its accumulation on the ground.

Clean Coal. Coal that has been crushed and washed and is ready for use.

Cogeneration. Using the surplus heat that is generated in the coal burning/-electrical generation process for other industrial and domestic applications, i.e., home heating.

Collector Well. A well with lateral collectors eminating out from the bottom which is set into a water-bearing formation (aquifer).

Colorado Water Rights: Absolute: Under Colorado Water law, an absolute water right is a perfected right, with a given priority data, to divert, store, or consumptively use a certain amount of water. To perfect a water right, it is necessary to demonstrate that the water has been put to beneficial use.

Conditional: Under Colorado Water Law, a conditional water right is a right to perfect a water right or make it absolute. When a conditional water right is perfected, it retains its original priority date.

Complex. Fish (hybrids) whose characteristics fall between described typed specimens (species) due to hybridization.

Cultural Resources. Nonrenewable remains of human activities, occupations, and endeavors as reflected in sites, buildings, structures, or objects, including works of art, architecture, and engineering. Cultural resources are commonly discussed as prehistoric and historic values, but each period represents a part of the full continuum of cultural values from the earliest to the most recent.

Decommissioning. The act of taking a power generating or industrial facility out of service, sometimes referred to as mothballing.

Dewater/Dewatering Complex. Facility designed to remove water from coal which has been suspended in a slurry.

Distribution Line. Medium voltage, medium current electrical transmission lines used to distribute power to consumers.

Drawdown. The magnitude of the change in surface level of water in a well, reservoir, or resulting from the withdrawal of water.

Ecosystem. A functional system which includes the organisms of a natural community together with the non-living factors of their environment. Derived from ecological system.

Effluent/Sewage Effluent. The liquid waste of sewage and industrial processing.

Endangered Species. Any animal or plant species in danger of extinction throughout all or a significant portion of their range.

Essential Habitat. Habitat determined to be necessary for the survival and propagation of a species. It constitutes the initial identification of potential critical habitat. Only the Secretary of the Interior can designate critical habitat.

Exotic. Animal species that have been substituted for native species that have been displaced from their environment by man.

Exploration Area. An area searched for economic deposits of minerals, ore, gas, coal, or oil.

Federal Logical Mining Unit (LMU). As determined by USGS, an area of coal land that can be developed and mined in an efficient, economical, and orderly manner with due regard for the conservation of coal reserves and other resources. An LMU may consist of one or more leases and may include intervening or adjacent non-Federal lands.

Flue Gases. Gasses, usually carbon dioxide, water vapor, oxides of nitrogen, and other trace gases, which result from combustion processes.

Fly Ash. Lightweight solid particles which are carried by flue gases.

Ground Water. All subsurface water, especially that part in the zone of saturation.

Insolation. Solar radiation received at the earth's surface.

Long Wall Mining. Removing a mineral from an extensive exposed surface of a deposit, usually underground, where minerals are removed by a shearing machine, and roof support is provided by movable hydraulic jacks.

Low Load Flame. The flame that must be maintained to meet daily minimum or low load power needs.

Megawatt (MW). A unit of power equal to 1,000,000 watts.

Model. A mathematical or physical system obeying certain specified conditions whose behavior is used to simulate and understand a physical, biological, or social system to which it is in some way analogous.

National Register of Historic Places. A national listing of historic properties warranting protection.

Nationwide Rivers Inventory. The Nationwide Rivers Inventory is a preliminary screening process being conducted by the Heritage Conservation and Recreation Service to identify the best remaining free-flowing rivers in the nation that may be appropriate for protection at the Federal, State, or local level.

Off-Road Vehicle (ORV). A vehicle (including four wheel-drive, trail bikes, hovercraft, snowmobiles, etc., but excluding helicopters, fixed wing aircraft, and boats) capable of traveling off roads over land, water, ice, snow, sand, marshes, etc.

Off-Road Vehicle Closure Area. An area closed to the use of off-road vehicles to prevent damage to resources or preserve certain values such as solitude.

Overland Conveyor. Any material-handling machine designed to move free-flowing bulk materials (such as crushed coal) over horizontal, inclined, declined, or vertical terrain with continuous motion.

Paleontology. A science that deals with the life of past geological periods and is based on the study of fossil remains of plants and animals.

Particulates. Microscopic pieces of solid particles which remain individually dispersed in gasses and stack emission. They emanate from a range of sources and are the most widespread of all substances that are usually considered air pollutants. Those between 1 and 10 microns are most numerous in the atmosphere.

Particulate Matter. Matter in the form of small liquid or solid particles.

pH. A number that represents the negative logarithm, base 10, of the hydrogen-ion activity of a solution. A pH less than 7 indicates an acid solution; a pH greater than 7 indicates an alkaline solution.

Plume. The air space containing substances emitted from a point source. For practical purposes, the limits of a plume are defined according to some minimum concentrations of the substance(s).

Portal. Entrance into a mine; also may be the point of withdrawal for material mined.

Preference Right Lease. A non-competitive lease right which guarantees the party who conducted the exploratory activities the option of mining any deposits found.

Raptor. A group of carnivorous birds consisting of hawks, eagles, falcons, vultures, and owls.

Regime. The existence in a stream channel of a balance between erosion and deposition over a period of years.

Room-and-Pillar Mining. An underground mining technique in which small areas of a coal or oil shale seam are removed and columns of the deposit are left in place to support the roof.

Rotary Breaker. A breaking machine for coal or ore; consists of a screen, a heavy steel shell, and lifts which raise and convey the coal and stone forward and break it. As the material is broken, undersized pieces pass through the apertures.

Run-of-Mine (ROM) Coal. The unscreened output of a mine, also known as mine run.

Scrubber. Equipment used to remove or wash out pollutants, such as sulfur dioxides or particulate matter from gas emissions, usually by means of a liquid collector.

Scrubber Sludge. A scrubber byproduct with the consistency of toothpaste. Its chemical composition is primarily $CaSO_4$ (calcium sulfate) and water.

Secondary Zone of Influence. The area within 100 miles or 2 hours driving time that is normally utilized by residents for recreational pursuits.

Shield Wire. Insulated wire covered with a metal shield, usually made of tinned braided copper wire.

Slurry. A free flowing, pumpable suspension of fine solid material suspended in a liquid.

Slurry Pipeline. A pipeline designed to transport a slurry, e.g., crushed coal suspended in water.

Special Values (Recreation). Areas with unique features, of high volume use, and/or high public concern.

Stomate. A minute opening, in leaves of plants and stems through which gasses pass.

Subsidence. A sinking down of a part of the earth's crust due to underground excavations.

Substrate. Any layer underneath the soil.

Threatened Species. Any animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Trace Element. A chemical element found in small quantities (less than 1 percent) in a mineral or compound.

Value Systems. A set of perceived ethical or moral values recognized and maintained by individuals, segments of a community, or the community as a whole.

Visual Resource Management System (VRM). Classification containing specific objectives for maintaining or enhancing visual resources, including the kinds of structures and modifications acceptable to meet established visual goals.

Wet Limestone Scrubber. A scrubber which uses limestone dissolved in water which is injected into flue gases to remove SO_2.

Wheeling. The use of existing powerlines and terminals owned by one company to distribute power generated by a different company.

LIST OF ABBREVIATIONS

a.c.	alternating current
ADT	Average daily traffic
ASCS	Agricultural Stabilization Conservation Service
BACT	Best Available Control Technology
BLM	Bureau of Land Management
Btu	British thermal unit
C	Centigrade
CDW	Colorado Division of Wildlife
CEES	Colorado Energy Extension Service
cfs	cubic feet per second
CO_2	carbon dioxide
CRSP	Colorado River Storage Project
CRWCD	Colorado River Water Conservancy District
CSMRT	Colorado School of Mines Research Institute
CUP	Central Utah Project
dBA	weighted sound level
DOE	Department of Energy
EA	Environmental Assessment
EHV	extra high voltage
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
F	Farenheit
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FGD	flue gas desulfurization
g/s	grams per second
Gwh	gigawatt hours
ICPA	Intermountain Consumers Power Administration
kV	kilovolt
LC&I	large commercial and industrial
L&WCF	Land and Water Conservation Fund
mg/ℓ	milligrams per liter
MLEA	Moon Lake Electric Association
MST	Mountain Standard Time
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NOx	nitrogen oxides
NO_2	nitrogen dioxide
NPS	National Park Service
NSPS	New Source Performance Standards
ORV	Off-road vehicle
PRLA	Preference right lease application
PSC	Public Service Commission
PRS	Power Requirements Study
PSD	Prevention of Significant Deterioration
REA	Rural Electrification Association
ROW	right-of-way
SAI	Systems Application, Inc.

LIST OF ABBREVIATIONS (concluded)

SCS	Soil Conservation Service
SC&I	small commercial and industrial
SHPO	State Historic Preservation Officer
SOx	sulfur oxides
T&E	threatened and endangered
TDS	total dissolved solids
TSP	total suspended particulates
UDWR	Utah Division of Wildlife Resources
UP&L	Utah Power and Light
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
WAPA	Western Area Power Administration
WRSP	White River Shale Project
YJWCD	Yellow Jacket Water Conservancy District

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